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FLUCTUATIONS IN THE BALTIC STOCK OF SALMON (1921—1935)

BY

T. H. JÄRVI

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Foreword.

In undertaking the task, the results of which are described in this publication, my intention was to investigate as thoroughly as possible the fluctuation phenomena appearing in salmon fishing, and the causes of same. With this aim in view it was necessary, of course, first of all to determine the relative individual abundance of the different year-classes forming the stock of salmon in the Baltic during the period appointed for investigation.

I have been cognizant of the fact that complete success in this aim would be open to question, as the material used for the basis of the investigation has been obtained only from Finnish salmon rivers or their neighbouring grounds at sea, i. e., from a fairly restricted area of the Baltic. The stock of salmon in the Baltic, taken as a whole, is formed in the rivers emptying their waters into the various regions of this sea. The extensive geographical divergence in the breeding grounds of the salmon is certain to have an influence on the yield, neutralising the effects of climatic conditions on the original individual abundance of the year-classes born in different localities, as there can be, and are, very great variations in the climate of different regions. Should the salmon, however, return to their own rivers to spawn, a theory given general support, the effect of climatic conditions prevailing during the breeding season on the different year-classes should make its appearance on the salmon reaching their ascending and spawning age.

There are several reasons for supporting the assumption that the salmon rivers of northern Finland and Sweden at present represent the largest breeding grounds of the stock of salmon in the Baltic, taken as a whole, or of the different stocks of salmon — if that originating in each river is treated separately — and that they also contribute the largest portion to each migrating shoal of salmon in the Baltic.

The most delicate period of the breeding season of individual salmon lasts throughout the winter. In Finland this is of long duration — several months — particularly in the northern river region. During its course both the height of the water in the rivers and the frost conditions may fluctuate considerably over the same year, not to mention over several years. At first thought it appears probable, therefore, that these conditions have a decisive influence on the original abundance of individuals in the year-class. The effects of these factors, in so far as they can be judged from the catch of salmon in Finland, will be seen from my investigation.

The quantity of fish that have spawned can also be taken as a factor influencing the abundance of the individuals of the year-class being bred. On the basis of my experiences of other species of fish I considered this as a factor, but nevertheless probably of only secondary importance.

The results of my investigations will be found to cover a wider field if they can be combined with corresponding investigations made concurrently in other Baltic countries. As investigations of this type are now being made, I consider that the material provided from Finland will shed a strong light on Baltic salmon conditions prevailing during later years.

My investigations, as they are given here, were planned so long ago as 1917, and at the end of the fishing season that year I obtained a large collection of scale specimens from the Oulu River. My original plan to make my investigations in the Oulu River was prompted on the one hand by the fact that the International Council for the Exploration of the Sea had decided that the salmon of the Oulu River must be specially investigated (see Henking and Sandman, 1913), and on the other, by the existence of detailed information on the salmon catches from the Oulu River dating from 1863.

The exceptional conditions prevailing in Finland in 1918 and other circumstances prevented me from carrying out my scheme. This period was followed by a complete revolution in fishing conditions in the Oulu River: the local salmon weirs used for centuries (Raatinpato weir at the Merikoski Rapids near the city of Oulu, and the Muhos weir in the parish of Muhos) had been abandoned, while the fishing rights also changed hands. An interval thus began during which I was able to obtain only a few scale specimens

from the river for investigation purposes. Only since 1925 have I succeeded in obtaining suitable specimens from the Oulu River.

Some time previously, i. e. 1920, I had been able to organize collections of scale specimens and accompanying measurements in both arms of the Kymi River at Langinkoski Rapids and Ahvenkoski Rapids — but since 1924 only from the eastern arm, then, however, both from Langinkoski Rapids and from Ränninkoski and Siikasaari fisheries situated above the rapids. Since August 1931 the spawning of salmon in the western arm — the Ahvenkoski Rapids — has entirely stopped and with it the salmon fishing, as the stream was then closed by the dam built in connection with the power station.

In 1922 the Kemi River was included among the rivers under investigation, when specimens were collected from the Korva, or Kilo, weir.

In 1925 a change was made at all these sites where specimens were collected and where formerly so-called random tests had been made, in that from then on scale specimens were taken from every individual salmon caught at the collecting stations. Unfortunately this rule was not very strictly observed during the first few years.

In 1925 collecting work was also begun in the Kokemäki River at Lukkarinsanta above the town of Pori.

Collecting work in the Tornio River was begun in 1930.

In 1931 a change was made in collecting specimens from the Kemi River, owing to the difficulties created by timber floating at the Korva weir, difficulties which finally led to the complete cessation of fishing there; specimens from then on being taken principally from catches of salmon made in the sea at the mouth of the river (Valkeasaari fishing grounds).

In addition to the above-mentioned specimens, I have had small specimen collections from the Kemi River (75 specimens) dating from 1915 and from the Kokemäki River (68 specimens) dating from 1915—17. These of course could not be used for investigating the composition of the stock, but they nevertheless provide some sort of estimation of the age and growth of the salmon caught.

It will be clear from the above that my material has been collected by other persons and I am extremely grateful to many collectors for their interest and labours on my behalf.

The following persons have either undertaken the collecting of specimens over long periods or have supplied me with the largest collections:

Oulu River: Lauri Saarela (1917), J. Kaiponen (1922—35) and Jaakko Kurtti (1934—35).

Kemi River: Yrjö Vuoti (1922—32), Olli Kilpelä (1932—35) and V. Alaruikka (1932—35), together with Matti Rantapörhölä (1929, 1931—35) from the sea, outside the mouth of the Kemi River.

Tornio River: Pentti, Hulda, and Tuomas Pelttari (1930—35).

Kokemäki River: Fred. Tähtinen (1925—29, 1934—35) and Lauri Leino (1930—32).

Kymi River: K. Ahola (1920—24), J. Leikas and E. Leisti (1925—35), and V. Vilkman (1920—23).

The task of drawing up the tables in connection with my investigation has been undertaken by Misses Toini Muroma and Helma Stenborg, the former handling the biological, and the latter the catch statistics. Mr. Oiva Jonasson has assisted in preparing and interpreting the scales: he has also been responsible for taking the necessary photographs.

I would like to take this opportunity of expressing my sincere thanks to all who have given their assistance.

No figure illustrating salmon scales has been included in this paper, as selected samples have been published separately two years ago in the present series of publications (Rapp. et Proc.-Verb., Vol. XCVII).

I. Catch Fluctuations in Baltic Salmon Fishing during the Period 1920—1935.

1. Salmon Catches obtained in Finland according to Statistical Information.

Fishing centres. From ancient times the main Finnish salmon fishing centre has been the northern region of the Gulf of Bothnia[1]) — the so-called Bothnian Bay costal area — stretching from Oulu to Tornio. The determining factor in this is provided by the many rivers of considerable size which enter the sea along this coast, and which with the melting of the winter snows develop into torrents. In former days fishing was principally confined to the lower reaches of rivers: nowadays it is practised at sea in the neighbourhood of the estuaries. I shall call this large salmon fishing centre the Bothnian Bay salmon area.

There are comparatively few areas along the coast of the Bothnian Bay and the Bothnian Sea starting southwards from the Oulu area — which also includes the neighbouring waters of Hailuoto — where the salmon approach the shores in shoals of any size. Of these places, on moving southward, can be mentioned the Kokkola and Pietarsaari area, certain parts of Merenkurkku, such as Klubbhällan, and the Kaskinen area. All these areas may be considered as intermediary stations separating the salmon region of the Bothnian Bay from that of southern Finland.

There are two southern Finland salmon regions. The first of these belongs to the Gulf of Bothnia area. The centre of this region used to be the Kokemäki

[1]) The waters of the Baltic Sea north of Åland, the Gulf of Bothnia (Pohjanlahti), are composed of two parts: the southern, the Bothnian Sea (Selkämeri) and the northern, the Bothnian Bay (Perämeri).

Table 1. Yield and Export of Salmon from Finland in 1920—1935.[1])
(Total Quantity, Catch from Sea and River).

Year	Yield in thousands of kilogrammes								Percentage of Total Yield							Export (net)[3])			
	Whole Country					Bothnian Bay			Whole Country				Bothnian Bay			Total Quant.		Fresh Fish	
	Total	Gulf of Bothnia	Gulf of Finland	Sea	River	Sea	River	Total	Gulf of Bothnia	Gulf of Finland	Sea	River	Sea	River	Total	1000 kg	%	1000 kg	%
1920..	301·3	243·9	57·4	200·5	100·8	130·7	84·9	215·6	80·9	19·1	66·5	33·5	43·4	28·2	71·6	42·1		6·0	
1921..	**371·3**	**325·2**	46·1	244·7	126·6	176·9	114·5	**291·4**	87·6	12·4	65·9	34·1	47·6	30·8	78·4	279·9	75·4	216·4	58·3
1922..	301·2	250·1	51·1	194·7	106·5	121·1	96·1	217·2	83·0	17·0	64·6	35·4	40·2	31·9	72·1	293·4	97·4	228·6	75·9
1923..	353·8	294·7	59·1	183·6	170·2	103·1	156·0	259·1	83·3	16·7	51·9	48·1	29·1	44·1	73·2	150·6	42·6	106·9	30·2
1924..	297·6[2])	261·6	36·0	155·0	142·6	89·2	126·1	215·3	87·9	12·1	52·1	47·9	30·0	42·3	72·3	69·7	23·4	50·4	16·9
1925..	218·0	187·9	30·1	156·3	61·7	82·6	52·2	134·8	86·2	13·8	71·7	28·3	37·9	23·9	61·8	145·2	66·6	123·3	56·6
1926..	191·9	163·0	28·9	142·6	49·3	82·1	38·0	120·1	84·9	15·1	74·3	25·7	42·8	19·8	62·6	109·9	57·3	98·0	51·1
1927..	159·8	**132·4**	27·4	111·5	48·3	52·3	32·7	**85·0**	82·9	17·1	69·8	30·2	32·7	20·5	53·2	100·5	62·9	92·4	57·8
1928..	178·5	**139·3**	39·2	131·4	47·1	61·3	32·6	**93·9**	78·0	22·0	73·6	26·4	34·3	18·3	52·6	88·2	49·4	84·5	47·3
1929..	181·9	146·9	35·0	135·4	46·5	70·2	38·2	108·4	80·8	19·2	74·4	25·6	38·6	21·0	59·6	55·2	30·3	53·0	29·1
1930..	207·3	180·5	26·8	156·9	50·4	100·4	38·6	139·0	87·1	12·9	75·7	24·3	48·4	18·6	67·0	124·8	60·2	119·3	57·5
1931..	260·9	213·2	47·7	216·7	44·2	144·5	36·3	180·8	81·7	18·3	83·1	16·9	55·4	13·9	69·3	119·9	46·0	117·2	44·9
1932..	264·8	201·9	62·9	222·3	42·5	124·0	34·7	158·7	76·2	23·8	84·0	16·0	46·8	13·1	59·9	146·9	55·5	146·5	55·3
1933..	250·8	223·5	27·3	158·5	92·3	108·5	77·3	185·8	89·1	10·9	63·2	36·8	43·3	30·8	74·1	141·1	56·3	137·4	54·8
1934..	265·6	**233·8**	31·8	199·3	66·3	127·5	58·6	**186·1**	88·0	12·0	75·0	25·0	48·0	22·1	70·1	145·8	54·9	144·6	54·4
1935..	298·2	221·9	76·3	237·2	61·0	107·7	53·2	160·9	74·4	25·6	79·5	20·5	36·1	17·8	53·9	137·8	46·2	133·6	44·8
Mean .	256·4	213·7	42·7	177·9	78·5	105·1	66·9	172·0	83·3	16·7	69·4	30·6	41·0	26·1	67·1	140·6	54·8	123·5	48·2

[1]) The waters of the Baltic north of Åland, i. e., the Gulf of Bothnia (Pohjanlahti, Bottniska viken) are composed of two parts; the southern, the Bothnian Sea (Selkämeri, Bottenhavet) and the northern, the Bothnian Bay (Perämeri, Bottenviken).
[2]) The figures for 1924—1927 differ from earlier figures, e. g., those in the "Bulletin Statistique" — owing to the fact that these included the catch (local) from Ladoga, which is now omitted.
[3]) Includes also exports of salmon from Ladoga, and is thus comparatively high.

River, distinguished by its numerous rapids, but nowadays this river has been utilised for industrial and power-providing purposes and is fast losing its importance as a salmon river.

The second of these regions comprises the Gulf of Finland, the eastern part in particular. The principal salmon rivers of this region are, on the Finnish side, the Kymi River (but only its eastern arm, as since 1931 the western arm has been dammed), and on the Esthonian side the Narva River. Apart from these certain Russian salmon rivers (e. g. the Luuka River) are of some importance as spawning rivers for this salmon region.

Statistical information on Finnish catches of salmon is not of the best — on the contrary. Apart from the fact that a considerable portion of the basic information is inaccurate, the statistics of catches are complicated by the inclusion of sea trout, and by the fact that the information is published separately as catches from sea and fresh water. The statistics on salmon and sea trout caught at sea can be employed to a certain extent, but it is impossible without going back to the original sources to separate accurately the fresh water catches from, first of all, the "Bothnian Bay" region (= Oulu administrative district) where large numbers of lake salmon are also obtained from fresh water, or from the Viipuri administrative district which contains not only the Kymi River, but also Lake Ladoga and the Vuoksi River, with their large catches of salmon.

Table 1 gives the official statistics of Finnish catches of salmon (and sea trout) for the years 1920—35. They are given as (a) the total catch from the whole country, sea and river; (b) the catch divided into the yields from sea and river fishing; and (c) the catch divided into the yields from the Gulf of Bothnia and the Gulf of Finland with their respective rivers. The boundary of the Turku and Uusimaa administrative districts, which ends at the sea slightly to the west of the city of Hanko, has here been selected as the boundary between the Gulf of Bothnia and Gulf of Finland regions. The catches of salmon from the Bothnian Bay — the largest salmon region — have been treated separately as they appear as catches originating in the Oulu administrative district region.

As the information on river-fishing in Finland also includes the trout species obtained in fresh water I have used these figures fairly freely. I have assumed that (a), the amounts of salmon given for the inland waterways of the administrative districts of Uusimaa, Turku and Pori and Vaasa can be regarded as representing salmon and I have taken these into consideration, and that (b), the statistics compiled from the Oulu administrative district, must also be

Table 2. Catches of Salmon at the most important Fishing Areas in 1921—1935
in thousands of kilogrammes and in percentages of regional value in Table 1.

Year	Gulf of Bothnia												Gulf of Finland	
	Bothnian Bay											Bothnian Sea				Total			
	Northern Salmon Area (Oulu Administrative District)										Vaasa Administrative District								
	Tornio Region	Kemi Region	Simo Region	Kuivaniemi	Ii Region	Haukipudas	Oulu Region	Hailuoto Region	Raahe Region	Above-mentioned Regions Total	Above-mentioned Regions % of Bothnian Bay Value in Tab. 1		Kaskinen Region	Pori Region	Rauma Region	Total	All Regions	% of Gulf of Bothnia Value of Table 1	Kymi Region	% of Gulf of Finland Value of Table 1
1921..	53·4	81·2	48·0	1·5	30·0	20·0	8·9	1·0	1·4	245·4	84·2	7·3	8·2	4·6	0·8	13·6	266·3	81·9	15·0	32·5
1922..	77·3	22·3	35·0	2·0	32·1	13·5	6·0	0·8	2·0	191·0	87·9	4·8	7·8	6·4	0·8	15·0	210·8	84·3	13·1	25·6
1923..	29·5	122·5	30·0	1·2	18·0	15·0	3·9	0·9	2·4	223·4	86·2	4·0	8·0	9·3	0·9	18·2	245·6	83·3	13·4	22·7
1924..	30·0	91·2	20·0	1·0	17·0	10·0	6·9	0·9	2·6	179·6	83·4	3·4	8·6	18·1	0·8	27·5	210·5	80·5	12·0	33·3
1925..	13·4	25·5	25·0	1·1	13·4	11·2	8·7	0·6	1·4	100·3	74·4	11·6	5·3	19·0	0·8	25·1	137·0	72·9	10·8	35·9
1926..	8·3	4·8	20·0	4·0	12·9	10·5	5·0	1·4	1·7	68·6	57·1	10·9	6·8	9·4	0·8	17·0	96·5	59·2	14·7	50·9
1927..	10·0	8·1	20·0	3·6	3·6	10·0	5·2	1·0	1·6	63·1	74·2	9·3	8·0	7·8	2·9	18·7	91·1	68·8	12·8	46·7
1928..	16·1	20·2	20·0	3·6	5·4	9·0	7·2	1·0	1·0	83·5	88·9	8·8	8·2	9·4	1·3	18·9	111·2	79·8	11·3	28·8
1929..	17·1	15·4	27·0	4·0	5·0	7·5	5·8	0·8	5·4	88·0	81·2	7·3	8·2	9·2	0·9	18·3	113·6	77·3	14·5	41·4
1930..	16·0	12·0	25·0	6·0	32·2	8·0	6·6	0·8	3·3	109·9	79·1	6·0	6·3	10·4	1·0	17·7	133·6	74·0	15·0	56·0
1931..	38·4	19·8	55·0	8·0	8·8	6·0	9·6	1·5	1·6	148·7	82·2	5·3	2·7	7·4	1·0	11·1	165·1	77·4	16·5	34·6
1932..	35·3	15·5	50·0	7·5	15·7	7·0	12·3	2·3	0·7	146·3	92·2	7·1	1·5	13·0	0·5	15·0	168·4	83·4	20·8	33·1
1933..	39·4	13·2	64·0	8·0	7·9	6·0	17·9	1·9	1·8	160·1	86·2	5·3	2·4	8·0	0·5	10·9	176·3	78·9	22·4	82·1
1934..	56·1	31·0	35·0	8·5	8·0	7·0	18·1	3·6	2·3	169·6	91·1	5·2	4·2	10·8	0·6	15·6	190·4	81·4	20·4	64·2
1935..	38·0	25·1	25·0	7·0	4·9	6·5	16·8	4·2	2·0	129·5	80·5	6·6	2·8	6·0	0·4	9·2	145·3	65·5	9·9	13·0
Mean .	31·9	33·9	33·0	4·5	14·3	9·8	9·3	1·5	2·1	140·5	81·7	6·9	5·9	9·9	0·9	16·8	164·1	76·8	14·8	34·7

In Table 2, the catch of Salmon, in sea and river, is compiled from regions divided as set out below:

A. Gulf of Bothnia: Bothnian Bay.

1. Northern Salmon area (= Oulu administrative district).

Tornio region: Alatornio (sea), Karunki and Ylitornio (river).

Kemi region: Town of Kemi + district (sea), Tervola and Rovaniemi (river).

Simo region: Simo parish (sea).

Kuivaniemi: parish of this name (sea).

Ii region: Ii (sea), Pudasjärvi and Taivalkoski (river).

Haukipudas: (sea and river).

Oulu region: Oulu (sea), Oulujoki, Muhos and Utajärvi (river).

Hailuoto: Oulunsalo, Hailuoto and Lumijoki (sea).

Raahe: Siikajoki, Saloinen, Pyhäjoki, Kalajoki and Pattijoki (sea).

2. Vaasa administrative district: Himanka, Lohtaja, Kälviä, Kokkola, Luoto, Pietarsaari, Uusikaarlepyy (sea).

B. Gulf of Bothnia: Bothnian Sea:

Kaskinen region: Kaskinen, Kristiina (sea).

Pori region: Ahlainen, Noormarkku, Pori, Ulvila and Nakkila (sea and river).

Rauma region: Rauma.

C. Gulf of Finland:

Kymi region: Kymi (sea and river), Pyhtää (sea), Vehkalahti (sea and river).

taken into consideration, nevertheless with the subtraction of 10 tons per annum. I have nevertheless (owing to the salmon of the Vuoksi and Lake Ladoga) omitted (c), the statistics on the inland waterways and rivers flowing into the eastern part of the Gulf of Finland from the Viipuri administrative district. In order to facilitate making comparisons I have calculated the percentage figures in addition to the figures indicating the amounts. According to the statistics thus derived, which are based on estimates, an average annual catch of 256 tons of salmon was obtained during the years 1920—35 in Finland. Of this the major portion — 83·3 % — was obtained from the Gulf of Bothnia and the rivers entering it. Of this percentage 67 % fell to the northern part of the Bothnian Bay (Oulu administrative district), so that only about 16 % remained to the other areas of the Gulf of Bothnia. Compared with this the percentage of salmon caught in the Gulf of Finland and the rivers entering it is of only secondary importance — 16·7 %. According to these statistics the mean annual yield is divided between sea and river fishing, the former amounting

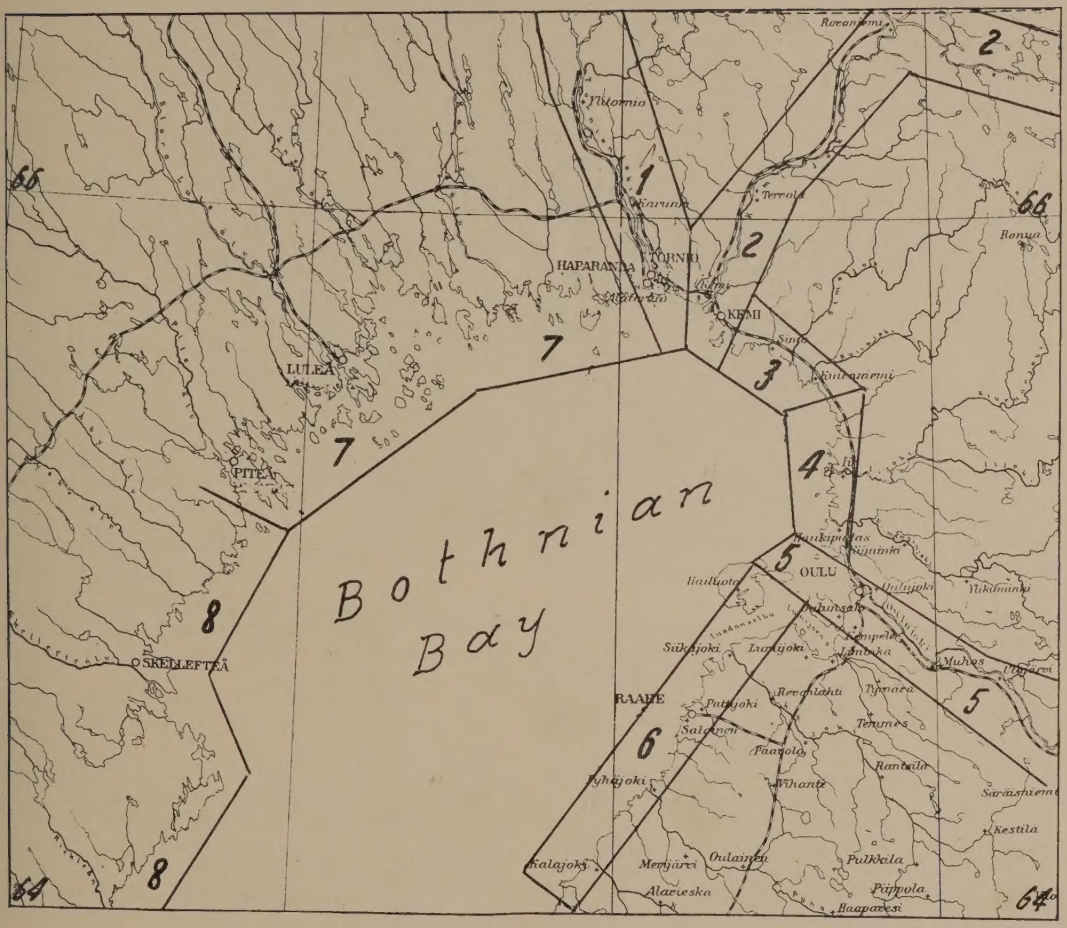

Fig. 1. Northern Region of Bothnian Bay, Salmon Areas:—
1. Tornio, 2. Kemi, 3. Simo and Kuivaniemi, 4. Ii-Haukipudas, 5. Oulu, 6. Raahe.
On the Swedish side: 7. Norrbotten, 8. Västerbotten.

to about 70% (69·4), and the latter to about 30% (30·6). I will not touch on the annual fluctuations appearing in the statistics.

I have utilised various sources in order to check the accuracy of the statistics given in Table 1.

For purposes of comparison I have first of all included in the table the figures indicating the quantity of salmon exported. A considerable portion of salmon caught in the Bothnian Bay finds a market abroad. These statistics have been obtained from accurate sources, as exporters of the fish have supplied the information on net weights of exported salmon. The export statistics of sea salmon are excessive, however, as they include fish obtained from Lake Ladoga. According to these statistics the annual export of salmon averages 48·2% of the yield. Exports of salted salmon are so small that the total annual exports of salmon amount to no more than 54·8% of the yield. The export percentages of the yield indicate that the fluctuations in the annual catch are not exact, as is only to be expected when one knows the methods employed in obtaining the original information. For example the estimate of the 1922 catch is too low as otherwise the export percentage of the total yield would have amounted to no less than 97·4%. This percentage is excessive, even though these exports include those of fish caught in Lake Ladoga. As, on the other hand, the export percentage of the 1924 yield is 23·4 and of the 1929 yield 30·3, it would appear, in spite of commercial fluctuations and the

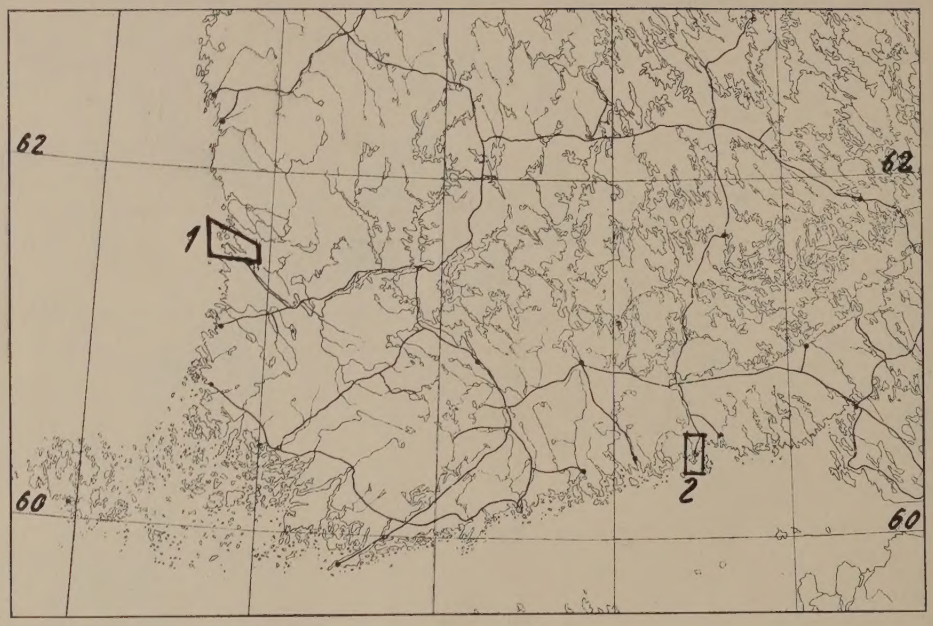

Fig. 2. Main Salmon Areas of Southern Finland:
1. Kokemäki River estuary, 2. Kymi River mouth and estuary.

inclusion of Ladoga salmon in exports, that the catches of these years have been over-estimated.

With regard to the catch statistics of Table 1, the original sources of information have been employed. These are the figures which the Central Bureau of Statistics has employed in compiling statistics. In Table 2 I have grouped the districts where fishing is principally of the river variety into certain areas, and the information on catches obtained therein has been added up. In this way an average of 81·7% of the Bothnian Bay catches of salmon has been covered.

I have treated the northern salmon area of the Bothnian Bay (Oulu administrative district) as nine separate regions: Tornio, Kemi, Simo, Kuivaniemi, Ii, Haukipudas, Oulu, Hailuoto and Raahe, and the southern part (Vaasa admin. district) as a tenth region. The southern part of the Gulf of Bothnia, i. e. the so-called Bothnian Sea, is represented by the Kaskinen, Pori and Rauma areas. With regard to the Gulf of Finland I have considered only the Kymi region as being an important salmon area.

During the period 1921—35 the average annual catch of the Bothnian Bay northern salmon area amounted to 140·5 tons, corresponding to 81·7% of the total quantity for the same area given in Table 1. This percentage is distributed among the different regions as follows: Tornio 18·5%, Kemi 19·7%, Simo 19·2%, Kuivaniemi 2·6%, Ii 8·3%, Haukipudas 5·7%, Oulu 5·4%, Hailuoto 0·9% and Raahe 1·2%. The Vaasa administrative district provides the Bothnian Bay with only an additional 4% of the total yield. The Bothnian Sea and Bothnian Bay regions included in the table together represent 76·8% of the Gulf of Bothnia yield, as included in Table 1. On the other hand, the yield from the Kymi region represents 34·7% of the Gulf of Finland yield given in Table 1.

The special place occupied by the Tornio, Kemi, and Simo regions in Finnish salmon fishing is clearly apparent from Table 2.

The share of districts excluded from the table is therefore inconsiderable, as only 14·3% of the average annual yield falls to these districts in the Bothnian Bay, and 23·2% to these in the Gulf of Bothnia in its entirety. The case is nevertheless different with regard to the Gulf of Finland, as the regions omitted represent 67·3%, and these included only 34·7% of the average annual yield. It should be mentioned particularly that the information supplied for the Simo region during the years 1923—30 does not appear to be accurate (during four years, of these three in succession, the catch was given as 20,000 kilos; during two years as 25,000, during one single year, as 27,000 and another single year 30,000 kilos).

The information on the Bothnian Bay catch for 1926 and the Gulf of Finland catch for 1933 is also probably far from accurate (the share of the Kymi region in each case is given as 82%).

A source for controlling general statistics of catches is provided by the statistics of Tables 3 and 4; I shall call these the special statistics.

The Finnish state owns many outstanding salmon fishing grounds, particularly in the Bothnian Bay salmon area. The state does not interest itself in fishing, however, but the grounds are let for a certain period of the year. The hire of the fishing grounds is subjected to supply of data on catches. The special statistics thus obtained have been at my disposal and in part I have determined their particulars. These statistics of state-owned salmon fishing grounds contain daily reports on the number of fish obtained and the total weight divided into five different size classes: less than 3 kilos, 3·5—7, 7·5—13, 13·5—19, and above 19 kilos in weight.

These statistics have been put into table form on the basis of areas as follows:

1. Tornio area: embraces the Kiviranta and Sumisaari weirs in the Tornio River, and the island waters at the mouth of the river lying within the parish of Alatornio.
2. Kemi area: embraces the Muurola, Köngäs, and Korva weirs in the Kemi River (the Korva weirs were used for the last time in 1932, and for only a short period at the beginning of the preceding fishing season), and the sea outside the estuary (some of the fishing grounds only, not including the Valkeakari fishing grounds).
3. Simo area: embraces the most important salmon fishing grounds of the sea area belonging to the Maksniemi and Simo villages, and of the waters beyond them. The area also includes the sea fishing grounds of the parish of Kuivaniemi situated a little to the south.
4. Ii — Haukipudas area: embraces the sea of the mouths of the Ii and Haukipudas Rivers.
5. Oulu area: The combined catches of the fishing grounds of the Pyhäkoski Rapids in the Oulu River.

A more detailed list of fishing grounds included is given in connection with the table (Table 3).

The above-mentioned separate statistics of catches of salmon obtained from state-owned fishing grounds — Table 3 — may be taken in the main as being fairly accurate. This table represents on an average about 51% of the yield from the Bothnian Bay, 41% of that from the Gulf of Bothnia, and 34% of the yield of the entire country, according to the figures given in the basic table, i. e. Table 1. The table shows, nevertheless, that the "representation" has fluctuated considerably over the years, being in some years (1923, 1924 and 1931) relatively low (30—35%), but rising in others up to 40—48%.

As the special statistics under discussion — Table 3 - give the number as well as the weight in kilogrammes, the mean weight of the fish obtained can be calculated — see Table 4.

I have used yet another source of comparison with regard to the catches of 1921—23. The State Railways have kindly supplied me with detailed statistics of the quantities of fresh salmon transported from the various stations and halts in the Bothnian Bay northern salmon area, i. e. those stations to the north of Oulu, during the open-water period of these years as well as the total quantities of salted salmon all the year round. These statistics have been incorporated in Table 5, in that the various stations have been combined to correspond to the Tornio, Kemi, Simo, Ii, and Haukipudas-Oulu salmon regions, i. e. the same regions that appear in the special statistics. With regard to these statistics, supplied by the State Railways, it should be noted that the values represent the gross amounts of fish transported. A comparison of the railways statistics with export statistics shows that as regards certain years (1921, 1922 and 1923)

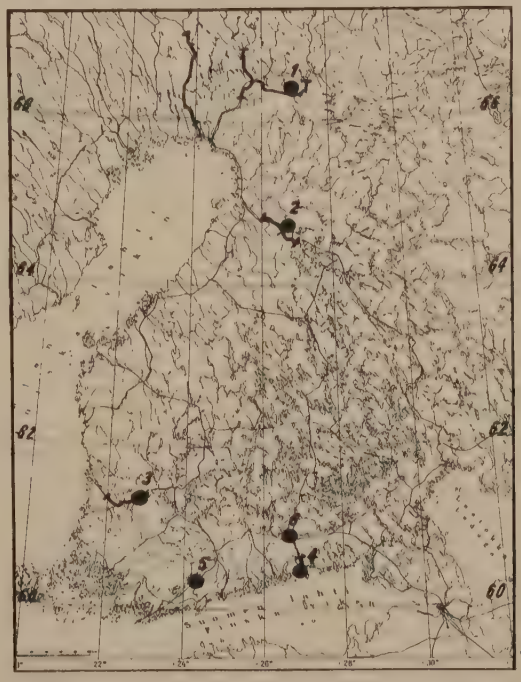

Fig. 3. Main Finnish Salmon Breeding Areas and active Hatcheries. 1. Kaihua on the Kemi River, 2. Pyhäkoski Rapids on the Oulu River, 3. Meskala on the Kokemäki River, 4. Langinkoski on the Kymi River, (5. and 6. Porla and Kuusankoski, hatcheries outside the salmon rivers).

Table 3. Statistics of Catches of Salmon from certain Fishing Grounds in the northern Salmon Area of the Bothnian Bay in 1921—1935.

Year	Catch in thousands of kilogrammes						in Percentage			Number of Salmon (in Areas)					
	Tornio Region	Kemi Region	Simo Region	Ii—Haukipudas Region	Oulu Region	Total	of total Yield of Whole Country	of Gulf of Bothnia Yield	of Bothnian Bay Yield	Tornio Region	Kemi Region	Simo Region	Ii—Haukipudas Region	Oulu Region	Total
1921.....	34·7	56·9	(58·6[1]))	—	7·5	(157·7)	42·5	48·5	54·1	3981	5559	—	—	715	(**10255**)
1922.....	39·6	35·8	(46·4[1]))	18·1	6·9	(146·8)	48·7	58·7	67·6	4020	3350	—	1817	604	(9791)
1923.....	18·7	19·3	25·6	10·6	4·5	78·7	22·2	26·7	30·4	2037	1980	3143	1222	370	8752
1924.....	15·2	14·9	22·9	5·1	7·0	65·1	21·9	24·9	30·2	1416	1394	2502	554	658	**6524**
1925.....	7·5	16·2	31·6	7·1	7·5	69·9	32·1	37·2	51·9	829	1759	5291	1209	697	9785
1926.....	8·0	7·3	27·8	10·0	3·9	57·0	29·7	35·0	47·5	1179	1009	5945	1632	514	10279
1927.....	15·3	13·8	(18·2[2]))	14·4	11·7	73·4	45·9	55·4	86·4	1911	1766	(2313[2]))	1720	1230	8940
1928.....	20·7	10·7	45·0	11·0	5·1	82·5	46·2	59·2	97·0	3347	1360	5993	1355	459	**12514**
1929.....	18·7	13·0	28·7	7·3	4·0	71·7	39·4	48·8	76·4	2018	1381	3449	839	337	8024
1930.....	15·2	16·5	38·0	6·9	6·3	82·9	40·0	45·9	76·5	1766	1831	5243	1040	566	10446
1931.....	11·1	3·2	35·4	8·1	5·7	63·5	24·3	29·8	35·1	1336	366	4897	1051	484	8134
1932.....	7·5	8·0	41·3	5·1	11·8	73·7	27·8	36·5	46·4	929	780	4660	567	1079	8015
1933.....	10·4	3·6	37·9	16·6	15·2	83·7	33·4	37·4	45·0	1719	536	5566	2186	1311	11318
1934.....	27·1	14·1	36·6	19·4	16·0	113·2	42·6	48·4	60·8	3354	1535	5274	2490	1614	**14267**
1935.....	10·6	11·6	28·1	14·9	13·0	78·2	26·2	35·2	48·6	1473	1315	4156	1904	1084	9932
Mean....	17·4	16·3	34·8	11·0	8·4	87·2	34·0	40·8	50·7	2088	1728	4495	1399	781	9798

[1]) According to Railway Transport Statistics 50 %.
[2]) Maksniemi catch omitted, not available.

The statistics given in Tables 3 and 4 have been compiled from information obtained from the following fishing grounds:—

Tornio region.

Sea

Herakarinkrunni .... 1922—35
Huituri ..... 1922—25
Inakari ..... 1922—28; 1934—35
Pensaskari ..... 1922—28; 1933—35

Weirs.

Kiviranta and Sumisaari..... 1921—35

Kemi region.

Sea.

Ajoksenkrunni ..... 1921—30; 1933—35
Inakari ..... 1922; 1928—32
Kallio ..... 1921—35
Murhaniemi ..... 1921—26; 1928—30; 1933
Pihlajakari ..... 1921—26; 1928—30; 1935
Sarvi ..... 1927—35

Weirs.

Korva (Kilo) ..... 1921—32
Köngäs ..... 1921—35
Muurola..... 1921—32; 1934—35

Simo region, Maksniemi.

Sea.

Haikara..... 1923—26; 1929—30; 1932—34
Halttari..... 1923—25; 1928—35
Junno ..... 1928—31; 1933—35
Karvo ..... 1923—26; 1928—30; 1932
Leuka ..... 1923—26; 1928—34
Röyttä..... 1923—26; 1928—35
Virtaniemi 1928; 1931
Ykskivi..... 1924; 1928—30; 1933—35
Ykskuusi..... 1923—26; 1928—34

Also some small fishing places during single years.

Simoniemi region.

Sea.

Aapeli ..... 1923—24
Haarakuusi..... 1923—25; 1928—35
Hevosenkenkä ..... 1923; 1929—33
Hunskeri..... 1923—35
Härkönen (Härkäletto) ..... 1923; 1926—29; 1933; 1935
Kantalannokka 1923; 1924; 1928
Kekosenniemi..... 1923—24;1926—30;1932—33;1935
Klapu ..... 1928—35
Knihtilänranta..... 1923—24
Koivuluoto ..... 1923—35
Korkiakari ..... 1924; 1926—35

Leipäre ..... 1925—35
Lettojuoni..... 1923; 1930; 1932; 1935
Maakarvo ..... 1925—29; 1931—32; 1935
Maalahti ..... 1923—26
Maijankari ..... 1928—34
Maisterin matala.... 1924; 1934—35
Montaja..... 1923—35
Möyly ..... 1923; 1926—35
Pappilannokka..... 1924—26
Peräjuoni ..... 1923—35
Pihlajakari ..... 1923—26; 1928—34
Pikkukalla ..... 1928; 1930—35
Plassi..... 1923—24; 1926; 1928—35
Rajaletto..... 1923—25
Selkäkari..... 1923—35
Syvänsija ..... 1923—25;1927;1929—30;1934—35
Tiuranen..... 1923—35
Vafunki..... 1923—35
Verkkomatala ..... 1923—24
Virtaniemi 1929; 1931

Also some small fishing places during single years.

Kuivaniemi region.

Sea.

Aaponmatala ..... 1934—35
Hietakalla..... 1925—35
Hijanjuoni ..... 1933—34
Häskeri..... 1923—30; 1932—35
Isomatala ..... 1932—34
Kokko..... 1925; 1927—35
Kaakkurinniemi..... 1923—35
Koivuluoto..... 1923—25; 1927—35
Krassi ..... 1923—25; 1927—35
Kuivamatala ..... 1923—27; 1929; 1931; 1933—35
Kyytikari ..... 1923—35
Käpsänkallio ..... 1924—35
Lahdenmatala ..... 1924—30; 1932—35
Liippo ..... 1925—35
Nikannenä ..... 1925—31; 1933—35
Onsajanmatala..... 1923—35
Oriniemi ..... 1923—35
Rahtunen ..... 1923—30; 1932—35
Rauma ..... 1924—35
Rintamatala..... 1925—26; 1932—33; 1935
Röyskerinkalla..... 1924—26; 1929—35
Samuli..... 1924—25; 1927—28; 1930—35
Siikamatala ..... 1925; 1933—34
Ulkomatala..... 1925; 1927—28; 1933—35
Vanhamatala ..... 1923; 1926—28; 1930; 1932—35

Also some small fishing grounds during single years.

Ii region.

Sea.

Antinmatala..... 1923—25; 1927—31; 1933—35
Keskiletto..... 1923; 1925; 1927; 1929; 1933—35
Kutinkalla ..... 1923; 1931; 1933—35
Kutuletto ..... 1923; 1924—25; 1927; 1930; 1933
Laitakari..... 1923; 1925—31; 1933—35
Lounaletto ..... 1929—31; 1933—35
Lännensija ..... 1923; 1929—31; 1933—34
Maakaapri..... 1923—29; 1931; 1933—35
Maaklaama..... 1927; 1929—30; 1933—35
Majava 1923; 1929
Mustakivi ..... 1923; 1925—29; 1931; 1933—35
Nokkaletto ..... 1933—35
Nälli..... 1929; 1934—35
Papinkari ..... 1923; 1931; 1933—35
Petäjäluoto..... 1923—34
Peura..... 1933—35
Pihlajakari ..... 1933—35
Pikkueteläsija 1924; 1933
Pitkäkari ..... 1923; 1933—35
Praava..... 1933—35
Pöydänpäänletto.... 1923—27; 1929—31; 1933—35
Röyttä..... 1923; 1933
Syvänjuoni..... 1923; 1930—31; 1933—35
Tukkikari..... 1923—25; 1927; 1933—35
Ulkokaapri..... 1923—29; 1931; 1933—35
Ulkoklaama..... 1923; 1933—35
Ulkoletto..... 1923; 1928—30; 1933—35
Ulkovalkama..... 1923; 1929—30; 1933—34
Vanhamantti..... 1923—24; 1934

Weirs.

Venäjänkari, Haukka and Illi..... 1922—35

Also some fishing places during single years.

Haukipudas region.

Hoikkahiue..... 1923—35
Konikari..... 1923—33; 1935
Kropsu ..... 1923—33; 1935
Pensaskari..... 1923—35

Oulu River region.

Pyhäkosken apajat.. 1921—34
Maijala ..... 1925—27; 1933—34
Varvikko..... 1922; 1924

Kokemäki River region.

Lukkarinsanta..... 1921—35

Kymi River region.

Langinkoski..... 1921—35
Ränninkoski and Siikasaarenkoski... 1921—35

Table 4. Number and Average Weight of Salmon caught at certain Fishing Grounds of the Bothnian Bay, northern Salmon Area.

Year	Number														
	Tornio			Kemi		Simo			Ii-Haukip.		Oulu	Total	Southern Finland		
	Kivi-ranta	Sumi-saari	Alator-nio (Sea)	Korva Köngäs Muurola	Off Kemi	Maks-niemi (Sea)	Simon-kylä (Sea)	Kuiva-niemi (Sea)	Ii (Sea)	Hauki-pudas	Oulu River		Koke-mäki	Kymi River	Total
1921.....	2318	1663	—	4989	570	—	—	—	—	—	715	(10,255)	267	596	863
1922.....	1497	2114	409	2908	442	—	—	—	1817	—	604	(9,791)	329	1149	1478
1923.....	1117	448	472	1279	701	1196	1797	150	1162	60	370	8,752	409	1038	1447
1924.....	925	251	240	1054	340	815	1346	341	496	58	658	6,524	319	621	940
1925.....	336	75	418	1384	375	1712	2531	1048	1108	101	697	9,785	591	518	1109
1926.....	722	37	420	604	405	1251	3296	1398	1540	92	514	10,279	434	725	1159
1927.....	1238	97	576	1050	716	—	1573	740	1660	60	1230	8,940	205	813	1018
1928.....	2320	577	450	788	572	1954	2804	1235	1275	80	459	12,514	106	596	702
1929.....	1620	193	205	830	551	1308	1489	652	780	59	337	8,024	102	423	525
1930.....	1149	158	459	1164	667	2471	1895	877	975	65	566	10,446	122	261	383
1931.....	937	118	281	252	114	2068	2141	688	989	62	484	8,134	28	431	459
1932.....	345	152	432	642	138	2025	1935	700	470	97	1079	8,015	76	585	661
1933.....	581	476	662	154	382	2109	2098	1359	2114	72	1311	11,318	167	119	286
1934.....	2014	285	1055	923	612	1897	2044	1333	2427	63	1614	14,267	175	247	422
1935.....	714	189	570	771	544	1490	1646	1020	1825	79	1084	9,932	188	269	457
Mean....	1189	456	475	1253	475	1691	2046	888	1331	73	781	9,798	235	559	794
Year	Average Weight in Kilogrammes														
1921.....	8·5	9·0	—	10·3	9·3	—	—	—	—	—	10·4	9·7	11·1	6·2	7·7
1922.....	10·4	9·5	9·8	10·9	9·0	—	—	—	10·0	—	11·4	10·3	7·6	7·2	7·3
1923.....	8·8	9·6	9·8	10·4	8·5	7·8	8·4	7·8	8·8	7·0	12·1	9·0	—	8·4	8·4
1924.....	11·0	11·2	9·3	11·4	8·4	8·4	9·8	8·2	9·2	8·3	10·7	10·0	—	9·0	9·0
1925.....	11·4	10·2	6·9	9·2	9·2	4·9	7·1	5·0	6·0	5·1	10·8	7·1	10·5	8·7	9·6
1926.....	6·8	7·5	6·7	7·5	6·9	—	4·8	5·7	6·2	5·1	7·7	5·6	10·8	5·6	7·6
1927.....	7·9	7·7	8·5	8·4	7·0	—	7·9	7·7	8·4	7·9	9·5	8·2	10·8	7·4	8·1
1928.....	5·6	6·0	9·2	8·7	6·9	7·5	7·6	7·4	8·2	7·5	11·1	8·5	10·7	8·1	8·5
1929.....	9·3	8·7	10·0	10·6	7·7	8·9	8·4	7·1	8·9	7·0	11·8	10·3	11·0	8·6	9·1
1930.....	8·7	8·3	8·4	9·9	7·5	7·3	7·4	6·9	6·7	6·7	11·2	9·3	11·0	9·9	10·3
1931.....	7·4	8·9	10·9	8·9	8·0	7·2	7·3	7·3	7·8	5·8	11·8	7·8	12·4	6·8	7·1
1932.....	7·5	6·9	8·9	10·3	10·1	9·6	8·4	7·8	9·4	7·5	10·9	9·2	11·4	7·3	7·8
1933.....	5·9	4·4	7·3	4·4	7·7	7·8	5·8	6·9	7·6	7·4	11·6	7·4	10·3	10·5	10·4
1934.....	7·7	6·6	9·2	9·8	8·3	6·8	6·6	7·7	7·8	7·9	9·9	7·9	10·3	9·9	10·1
1935.....	6·3	5·0	9·1	9·3	8·2	7·3	6·4	6·5	7·9	6·5	12·0	7·9	10·4	10·0	10·1

they correspond fairly closely, particularly in respect of fresh salmon (most of the salted salmon is consumed in Finland). A comparison with the catch statistics of Table 1, on the other hand, does not produce equally good results. It would appear, therefore, that the catch statistics for 1923 were estimated at an excessive figure. I would also point out that the transport statistics further illustrate the tremendous importance of the Kemi and Simo salmon regions to the yield of Finnish salmon as it stands at present.

The above comparative survey of the various statistics shows that it is impossible to obtain accurate information on catches of salmon in Finland during different years, but that by balancing the sources of information against one another it is possible to evolve very true, if occasionally somewhat generalised, results.

2. Statistical Information on Catches of Salmon prepared in other Countries bordering the Baltic.

I will give a fairly detailed account of the statistics of catches of salmon compiled in Sweden — Tables 6—7. The reason for this is partly to show the varying importance of different regions as salmon-fishing centres along the extensive sea-board of Sweden,

Fig. 4. Outlets of Tornio and Kemi Rivers, and the Archipelago at the Estuary. 1. Sumisaari weir in the Tornio River, 2. Kiviranta weir in the Tornio River, 3. Korva weir in the Kemi River, 4. Centre of the Valkeasaari fishing grounds, 5. Maksniemi region in Simo Parish, 6. and 7. Röyttä and Halttari, the best salmon fishing sites in Finland.

particularly the Gulf of Bothnia, and partly to show the simultaneous or intermittent fluctuation phenomena in the various parts of this coast, and in order that comparisons in this respect might be made between the catches of salmon obtained from the northern Finnish and northern Swedish areas. In addition, the Swedish statistics of river catches often include information on the number of salmon. The Swedish figures on the average weight of salmon during different years thus derived can be compared with the corresponding Finnish figures, and shed light on the stages of development occurring in the fluctuation phenomena.

I have grouped the Swedish catch statistics into two different series: the first embracing the coast of the Gulf of Bothnia and the second the Baltic proper. The boundary is not, however, absolutely in its actual position, i. e. the Åland Sea, as the Stockholm administrative district in its entirety has been included in the Gulf of Bothnia area. The catch of salmon obtained in Sweden is divided on the average between the two areas: in that the Gulf of Bothnia area represents 53 % and the Baltic area 47 %. The total Swedish catch of salmon appears to be about double the Finnish, as is true also of the two coasts.

If on the basis of these statistics we seek the centres of the Swedish salmon fishing, we shall find that as in Finland the most important of these are situated in the Gulf of Bothnia area, to the north and west of the Bothnian Bay. The average annual catch of the Norbotten administrative district represents 55 %, and that of the Västerbotten administrative district

Table 5. Quantities (gross) of Salmon conveyed by railways between Oulu—Tornio—Rovaniemi in 1921—1923.

	Thousands of Kilos			Percentage		
	1921	1922	1923	1921	1922	1923
Fresh Salmon						
1. Tornio	0·4	6·1	4·3	0·2	2·0	3·6
2. Kaakamo, Laurila-Muurola, Lautiosaari, Kemi	69·6	**98·2**	32·0	27·3	**32·3**	26·8
3. Maksniemi, Viantie, Simo ...	**111·1**	77·7	31·5	**43·7**	25·5	26·3
4. Kuivaniemi, Olhava	5·7	8·5	2·2	2·2	2·8	1·8
5. Ii	48·3	**94·2**	21·1	19·0	**30·9**	17·7
6. Haukipudas, Oulu	19·4	19·7	28·5	7·6	6·5	23·8
Total...	**254·5**	**304·4**	**119·6**	100·0	100·0	100·0
Salted Salmon						
1. Tornio	38·7	10·8	8·5	19·6	5·0	4·6
2. Kaakamo, Laurila-Muurola, Lautiosaari, Kemi	**83·2**	**98·3**	**93·5**	**42·0**	**45·6**	**50·5**
3. Maksniemi, Viantie, Simo...	6·2	15·0	7·2	3·1	7·0	3·9
4. Kuivaniemi, Olhava	23·8	17·4	17·0	12·0	8·1	9·2
5. Ii	34·9	62·4	47·8	17·6	29·0	25·8
6. Haukipudas, Oulu	11·2	11·4	11·1	5·7	5·3	6·0
Total...	198·0	215·3	185·1	100·0	100·0	100·0
Fresh and Salted Salmon						
1. Tornio	39·1	16·9	12·8	8·6	3·3	4·2
2. Kaakamo, Laurila-Muurola, Lautiosaari, Kemi	**152·8**	**196·5**	**125·5**	**33·8**	**37·8**	**41·2**
3. Maksniemi, Viantie, Simo...	**117·3**	92·7	38·7	25·9	17·8	12·7
4. Kuivaniemi, Olhava	29·5	25·9	19·2	6·5	5·0	6·3
5. Ii	83·2	**156·6**	68·9	18·4	**30·1**	22·6
6. Haukipudas, Oulu	30·6	31·1	39·6	6·8	6·0	13·0
Total Fresh and Salted	452·5	519·7	304·7	100·0	100·0	100·0
50% weight	**226·3**	**259·9**	**152·4**			
According to Export Statistics (Table 1)	279·9	293·4	150·6			
Yield (Table 1)....	291·4	217·2	259·1			

Table 6 (according to Alm, partly) and Table 7 (according to Bull. of Swedish Statist. Bureau): see pp. 18—19.

17% — a total of 72% of the total annual catch of the Swedish Gulf of Bothnia area. The Blekinge administrative district appears to be the principal centre of the Baltic proper, followed by the Kalmar administrative district, according to the mean annual catch during the period 1918—1935.

Of the Danish catches of salmon only those obtained in the Bornholm area have been included in Table 8, while the German yield is given in the same table by dividing the coast into three different fishing areas.

The Polish salmon statistics are of a special type and extremely valuable, for they give the large salmon and mielnica separately, as well as the number of all salmon caught since 1931. I have included these statistics in detail — Table 9 — owing to their great importance and special features.

The Esthonian catch statistics (Table 10) date from 1928 (no previous information compiled).

As a summary I have drawn up Table 10, in which the catch statistics from the various countries are grouped according to the different areas of the Baltic, i. e. the Baltic proper, the Gulf of Bothnia and the Gulf of Finland. The last-named area does not contain information on U.S.S.R. catches, but in any case the stock of salmon in the Gulf of Finland is of only secondary importance in this investigation. In addition, the stock of salmon in the Gulf of Finland, judging by various factors, is probably not in such close and direct relation to the shoals of salmon in the Baltic proper, as are the shoals migrating from and back to the Gulf of Bothnia.

It is interesting to examine the total yield of salmon from the Baltic (with its gulfs) from Table 10. According to this table it has fluctuated during the period 1928—1935 between about 950,000 and almost 1,400,000 kilos (in 1932). As mentioned previously the table does not include salmon obtained from the U.S.S.R. areas, and there are other reasons for assuming that the figures given above should be treated as minimum statistics. If we were to take the mean weight of salmon obtained from all the different sources as 5 kilos, the yield of Baltic salmon would amount annually to about 190—280 thousand individuals; this calculation, of course, is made only for the purpose of giving a general illustration of the situation.

3. Comparative Survey of Catch Years.

On seeking the phases of the fluctuation phenomena from Tables 1—10 described above, we find the following:

A. The maximum catch years occurred:

a. Gulf of Bothnia: 1921 and 1934 both in Finnish and Swedish territory.

The maximum in the former case is clearly apparent in the statistics of both countries; in the latter it appears to be weaker on the Finnish side, although

Table 8. Catches of Salmon from the Baltic proper in 1918—1935 (in thousands of kilos).

Year	Sweden							Denmark	Germany				Poland			Latvia	Total
	Gothland Sea	Kalmar Sea	Blekinge Sea	Blekinge Mörrum	Kristanstad Sea	Malmöhus Sea	Total	Bornholm Sea	Western Baltic	Pommern and Rügen	East Prussia	Total	Large Salmon	Mielnica	Total	Sea	
1918..	1·6	23·3	4·7	13·1	2·2	0·9	**45·8**	**19·5**	—	—	—	169·0	—	—	—	-	—
1919..	26·8	14·4	39·8	11·0	9·7	4·9	106·6	72·0	—	—	—	108·0	—	-	--	-	-
1920..	34·8	17·2	73·6	23·8	16·0	7·7	173·1	84·0	—	—	—	68·0	—	—	—	—	—
1921..	27·4	18·5	77·9	18·6	16·2	3·0	161·6	79·0	—	—	—	**43·0**	12·8	—	12·8	—	—
1922..	15·3	12·1	46·6	20·8	5·4	2·6	102·8	43·0	—	—	—	105·0	186·4	**53·6**	240·0	—	—
1923..	5·9	30·7	40·0	22·9	7·7	4·0	111·2	39·0	—	—	—	93·0	82·0	**4·7**	86·7	—	—
1924..	3·5	26·5	39·2	8·9	3·7	1·2	83·0	**15·0**	—	—	—	64·0	67·0	**3·7**	70·7	65·6	—
1925..	3·9	30·6	21·7	5·4	—	1·1	**62·7**	36·0	—	—	43·3	68·0	28·3	**6·5**	**34·8**	63·5	—
1926..	4·3	35·0	45·8	5·4	6·2	7·5	104·2	42·0	10·4	71·0	76·8	158·2	87·2	**28·0**	115·2	72·7	492·3
1927..	25·6	73·0	41·5	9·5	5·9	2·5	158·0	67·0	5·8	43·0	157·0	205·8	134·5	**38·8**	173·3	87·9	692·0
1928..	11·9	58·2	62·5	—	7·1	6·7	146·4	43·0	5·4	231·1	108·3	**344·8**	228·5	**30·6**	**259·1**	88·7	**882·0**
1929..	16·7	43·0	24·5	4·9	4·6	6·1	99·8	24·0	3·1	137·1	50·7	190·9	121·7	**10·3**	132·0	**139·9**	586·6
1930..	10·3	32·4	36·6	4·6	6·4	3·2	93·5	40·0	3·5	54·9	89·1	147·5	214·6	**21·1**	235·7	118·6	635·3
1931..	7·4	33·1	178·8	4·9	12·1	14·6	**250·9**	60·0	14·9	112·2	56·6	183·7	65·2	**12·9**	78·1	57·0	629·7
1932..	7·9	60·2	133·5	—	21·2	5·1	**227·9**	**157·0**	4·1	111·0	163·2	**278·3**	58·0	**25·6**	83·6	86·5	**833·3**
1933..	26·5	22·8	80·3	2·7	33·0	13·0	178·3	125·0	4·4	35·7	119·1	159·2	87·4	**13·2**	100·6	128·1	691·2
1934..	31·3	35·4	67·6	1·8	24·7	6·8	167·6	50·0	4·5	30·0	161·4	195·9	60·9	**3·6**	64·5	114·5	592·5
1935..	49·6	28·9	75·3	—	12·9	2·8	169·5	64·0	3·5	49·6	66·8	119·9	62·1	**3·4**	65·5	69·0	487·9
Mean .	17·3	33·1	60·6	10·6	11·5	5·2	135·7	58·9	6·0	87·6	99·3	150·1	99·8	18·3	116·8	91·0	652·3

this is probably inaccurate, as the quantity of specimen scales received during that year was particularly large, and exceeded all other years (6587 specimens, Table 11).

b. Baltic: 1928 and 1932.

With regard to the former year the catch obtained in German waters is the principal index of the maximum season; the latter is shown by the catches from southern Sweden and Denmark as well as German catches (Table 8).

It should perhaps be mentioned that the maximum Polish and Latvian catches occurred the following year — 1933. An upward trend was also noticed in catches from the Gothland waters during 1933, but it continued throughout 1934 and 1935 (Table 8).

1933 and 1934 were also maximum years in Esthonian waters, during the few years that statistics have been compiled in that country.

B. The minimum catch years occurred:

a. Gulf of Bothnia: 1926 and 1929.

These minimum years are best shown by the Swedish catch statistics; according to Finnish statistics the minimum years appear to have been in 1927 and 1928. According to the quantity of specimen scales sent me in 1926 from the Bothnian Bay area, 1926 also would appear to have been a minimum year (Table 11); this is also shown by the special statistics — Table 3.

Table 9. Polish Catches of Salmon in 1921—1935.

(Numbers and Mean Weight.)

Year	Large Salmon			Small Salmon		
	kg.	Number	Mean Weight	kg.	Number	Mean Weight
1921.....	12,773	—	—	—	—	
1922.....	186,396	—	—	53,642	**107,284**[1])	—
1923.....	82,047	—	—	4,716	9,432	—
1924.....	67,040	—	—	3,735	7,470	—
1925.....	28,332	—	—	6,505	13,010	—
1926.....	87,245	—	—	28,371	**56,742**	—
1927.....	134,463	-	-	38.795	**77,590**	—
1928.....	228,491	—	—	30,568	**61,136**	—
1929.....	121,729	—	—	10,262	20,524	—
1930.....	214,570	—	—	21,050	42,100	—
1931.....	65,220	6,550	10·0	12,900	22,831	0·57
1932.....	58,000	7,197	8·1	25,590	**50,008**	0·51
1933.....	87,380	12,931	6·8	13,210	**30,335**	0·44
1934.....	60,930	7,018	8·7	3,590	7,604	0·47
1935.....	62,070	5,503	11·3	3,390	6,982	0·49

[1]) Dixon writes: "We can take 400 g. as the average weight for small 'mielnica' salmon". (Journ. du Conseil, IX, p. 67.) I have assumed an average weight of 500 g.

Table 6. Swedish Catches of Salmon in

Year	Norrbotten					Västerbotten			
	Sea	Torne	Kalix	Lule		Sea	Skellefte	Ume	
1920	115·3	32·0	19·4	57·2	**223·9**	20·9	6·3	10·0	
1921	**176·2**	55·3	17·7	57·8	**307·0**	43·6	5·1	12·7	
1922	137·2	41·4	15·9	38·5	**233·0**	24·3	6·1	16·4	
1923	101·4	23·6	12·6	39·3	176·9	34·1	4·7	16·7	
1924	69·6	16·5	12·0	21·0	119·1	20·9	3·0	13·2	
1925	37·0	6·3	—	—	43·3	15·9	5·8	9·3	
1926	**33·8**	6·8	—	—	40·6	19·8	2·1	10·1	
1927	69·3	—	—	—	69·3	35·9	3·2	20·7	
1928	68·9	—	—	—	68·9	28·8	2·4	15·6	
1929	48·1	—	—	—	48·1	16·4	—	10·4	
1930	64·5	—	—	—	64·5	22·1	—	9·6	
1931	79·0	—	—	—	79·0	20·8	3·0	2·6	
1932	77·0	—	—	—	77·0	21·7	3·8	1·3	
1933	84·5	—	—	—	84·5	20·8	3·1	1·2	
1934	**180·8**	—	15·2	10·1	**206·1**	27·9	8·5	3·7	
1935	145·4	16·5	10·2	20·1	192·2	23·9	5·1	3·2	
Mean...	93·0	24·8	14·7	34·9	127·1	24·9	4·4	9·8	

Table 7. Catch of Salmon from certain Swe

	Thousands of Kilos													
	Torne	Kalix	Lule	Skellefte	Ume	Ångerman	Indal	Ljunge	Ljusne	Dal	Mörrum	Torne	Kalix	Lule S
1920	32·0	19·4	57·2	6·3	10·0	20·7	11·5	0·9	10·4	2·2	23·3	—	2612	5578
1921	55·3	17·7	57·8	5·1	12·7	23·3	20·0	3·3	14·0	4·3	18·6	—	—	5765
1922	41·4	15·9	38·5	6·1	16·4	18·6	16·1	1·8	14·8	6·5	20·7	4365	—	3538
1923	23·6	12·6	39·3	4·7	16·7	17·4	23·2	3·7	21·1	7·4	22·9	2348	—	3659
1924	16·4	12·0	21·0	3·0	13·2	12·3	15·7	1·5	13·9	3·6	(11·0)	1655	—	—
1925	—	—	—	5·8	9·3	14·0	15·8	2·0	12·2	2·4	(7·2)	—	—	—
1926	—	—	—	2·1	10·1	6·8	5·5	1·1	10·7	—	—	—	—	—
1927	—	—	—	3·2	20·7	13·1	11·7	1·9	14·2	5·4	—	—	—	—
1928	—	—	—	2·4	15·6	8·6	8·8	1·7	11·4	2·4	—	—	—	—
1929	—	—	—	2·0	10·4	5·0	4·8	0·9	12·2	2·3	4·9	—	—	—
1930	—	—	—	2·2	9·5	7·9	6·8	1·0	11·2	1·8	—	—	—	—
1931	—	—	—	2·9	2·6	6·5	7·7	0·8	7·8	2·3	2·4	—	—	—
1932	—	—	—	3·8	1·3	8·1	11·8	2·1	7·9	1·9	2·5	—	—	—
1933	—	—	—	3·1	1·2	15·5	15·3	3·7	5·9	2·9	2·7	—	—	—
1934	—	15·2	1·01	8·5	3·7	17·0	18·6	3·4	5·3	2·5	1·8	—	1834	1227
1935	16·5	10·2	20·1	5·1	3·2	19·8	18·1	2·4	9·4	2·4	—	2090	1125	1886
Mean...	30·9	14·7	34·9	4·1	9·8	13·4	13·2	2·0	11·4	3·4	10·7	—	—	—

b. Baltic: According to the statistics given in Table 10, 1924 and 1925 were minimum years. German and Danish catches were at their minimum figure in 1924, southern Swedish and Polish in 1925 (Table 8).

During earlier years the minimum periods in respect of the southern parts of the Baltic were 1918 in Denmark and southern Sweden, and 1921 in Germany.

C. Good and bad salmon years are grouped so that before and after the maximum years there are good years, and correspondingly before and after the minimum years bad years. Only a few intermediary years therefore had average catches. The foregoing refers to the fact that in salmon fishing there are certain factors that have a stabilising influence on

thnia Areas in 1920—1935 (in thousands of kilos).

Västernorrland				Gävleborg			Uppsala—Stockholm			Total	Percentage				
Anger-man	Indal	Ljung		Sea	Ljusne		Sea	Dal			Norr-botten	Väster-botten	V. Norr-land	Gävle-borg	Uppsala -Stockh.
21·6	8·6	0·9	46·6	8·4	10·4	18·8	2·2	2·2	4·4	**330·9**	67·7	11·2	14·1	5·7	1·3
23·3	16·9	3·3	54·5	9·3	14·0	23·3	3·1	4·3	7·4	**453·6**	67·7	13·5	12·0	5·2	1·6
18·6	16·0	1·8	46·5	11·1	14·8	25·9	2·5	6·5	9·0	**361·2**	64·5	12·9	12·9	7·2	2·5
17·4	23·2	3·7	61·2	13·1	21·2	34·3	3·8	7·4	**11·2**	339·1	52·2	16·4	18·0	10·1	3·3
12·3	15·7	1·5	37·5	4·7	14·0	18·7	3·5	3·6	7·1	219·5	54·3	16·9	17·1	8·5	3·2
14·0	15·8	2·0	40·2	4·0	12·2	16·2	3·3	—	3·3	134·0	32·3	23·1	30·0	12·1	2·5
6·8	15·6	1·7	32·9	5·2	11·1	16·3	3·1	—	3·1	124·9	32·5	25·6	26·3	13·1	2·5
13·1	11·7	2·0	39·5	5·4	14·2	19·6	3·8	7·7	11·5	199·7	34·7	29·9	19·8	9·8	5·8
8·6	8·8	1·7	33·0	6·7	11·4	18·1	3·2	3·1	6·3	173·1	39·8	27·1	19·1	10·4	3·6
5·0	4·8	0·9	16·9	3·6	12·2	15·8	2·8	3·1	5·9	**113·5**	42·4	23·6	14·9	13·9	5·2
7·9	6·8	1·0	23·9	4·1	11·2	15·3	2·7	2·7	5·4	140·8	45·8	22·5	17·0	10·9	3·8
6·5	7·7	0·8	25·8	4·4	7·8	12·2	2·2	3·2	5·4	148·8	53·1	17·8	17·3	8·2	3·6
8·1	11·8	2·1	32·0	8·1	7·9	16·0	2·9	4·1	7·0	158·8	48·5	16·9	20·1	10·1	4·4
15·5	15·3	3·6	43·8	7·7	5·9	13·6	3·5	2·9	6·4	173·4	48·7	14·5	25·3	7·8	3·7
17·0	18·6	3·4	49·6	9·2	5·3	14·5	2·9	2·4	5·3	**315·6**	65·3	12·7	15·7	4·6	1·7
16·3	18·1	2·4	50·5	8·6	9·4	18·0	2·8	2·4	5·2	298·1	64·5	10·8	16·9	6·0	1·8
13·3	13·5	2·1	39·7	7·1	11·4	18·5	3·0	4·0	6·5	230·3	55·2	16·7	17·2	8·0	2·8

on Rivers in Numbers and Kilogrammes.

Number						Average Weight in Kilos									
nger-man	Indal	Ljunge	Ljusne	Dal	Mörrum	Torne	Kalix	Lule	Skellefte	Ume	Anger-man	Indal	Ljunge	Ljusne	Dal	Mörrum
941	1255	93	—	443	2910		7·4	10·3	10·5	7·7	10·7	9·2	9·4	—	5·0	8·0
300	2077	314	—	613	2495		—	10·0	9·5	9·6	10·1	9·6	10·4	—	7·0	7·4
670	1648	185	—	974	2607	9·5	—	10·9	9·9	9·6	11·2	9·8	9·5	—	6·7	8·0
698	2456	401	—	1144	2793	10·0	—	10·8	9·4	9·3	10·2	9·4	9·2	—	6·4	8·2
105	1504	163	—	582	1379	9·9	—	—	9·6	8·7	11·2	10·5	8·9	—	6·2	—
485	1795	195	—	335	900	—	—	—	11·6	8·4	9·4	8·8	10·2	—	7·1	—
610	646	101	—	—	—	—	—	—	—	—	11·1	8·6	10·4	—	—	—
301	1271	198	1479	894	—	—	—	—	—	—	10·1	9·8	9·8	9·6	6·1	—
804	920	182	1180	358	—	—	—	—	9·9	—	10·7	9·6	9·1	9·7	6·6	—
473	568	101	1260	334	595	—	—	—	10·0	—	10·6	8·5	9·2	9·6	6·8	8·2
747	692	122	1104	278	—	—	—	—	8·5	9·0	10·6	9·9	8·2	10·1	6·6	—
634	926	90	834	520	267	—	—	—	10·6	8·9	10·2	8·3	9·2	9·4	4·5	9·1
770	1254	219	857	280	274	—	—	—	9·8	8·9	10·6	9·4	9·6	9·2	6·7	9·1
463	1640	331	580	405	277	—	—	—	10·1	7·1	10·6	9·3	11·1	10·3	7·1	9·9
598	2040	277	558	412	238	—	8·3	8·2	10·9	8·4	10·7	9·1	12·1	9·5	6·0	7·6
015	1974	247	954	350	—	7·9	9·1	10·7	9·1	9·0	9·8	9·2	9·7	9·9	6·9	—
288	1417	201	978	528	1340											

the divergencies appearing in the individual abundance of the various year-classes.

During the period 1920—1935 the years 1920, 1922 and 1923 were probably good salmon years as regards the Gulf of Bothnia. Of these the first preceded and the second two followed the maximum year of 1921. It can also be assumed that the years 1931—1933 as an average preceded the maximum year of 1934.

The weak period was therefore 1925—1930, with its two minimum years — 1926 and 1928.

With regard to the Baltic proper it would appear — if we exclude the minimum years 1918 and 1920 — that there were no bad salmon years other than the minimum years of 1924 and 1925. The maximum

Table 10. Catches of Salmon from the Baltic (including Gulfs) in 1920—1935
(in thousands of kilos).

Year	Gulf of Bothnia			Baltic				Gulf of Finland			Total
	Sweden	Finland	Total	Sweden and Denmark	Germany and Poland	Latvia	Total	Finland	Esthonia	Total	
1920	330·9	243·9	574·8	257·1	—	—	257·1	57·4	—	—	—
1921	**453·6**	**325·2**	**778·8**	240·6	55·8	—	296·4	46·1	—	—	—
1922	361·2	250·1	611·3	145·8	345·0	—	490·8	51·1	—	—	—
1923	339·1	294·7	633·8	150·2	179·7	—	329·9	59·1	—	—	—
1924	219·5	261·6	481·1	**98·0**	134·7	65·6	**298·3**	36·0	—	—	—
1925	134·0	187·9	321·9	**98·7**	**102·8**	63·5	**265·0**	30·1	—	—	—
1926	**124·9**	163·0	**287·9**	146·2	273·4	72·7	492·3	28·9	—	—	—
1927	199·7	**132·4**	332·1	225·0	379·1	87·9	692·0	27·4	—	—	—
1928	173·1	139·3	312·4	189·4	**603·9**	88·7	**882·0**	39·2	57·5	96·7	1291·1
1929	**113·5**	146·9	**260·4**	123·8	322·9	**139·9**	586·6	35·0	66·2	101·2	948·2
1930	140·8	180·5	321·3	133·5	383·2	118·6	635·3	26·8	95·0	121·8	1078·4
1931	148·8	213·2	362·0	310·9	261·8	57·0	629·7	47·7	99·1[1])	146·8	1138·5
1932	158·8	201·9	360·7	**384·9**	**361·9**	86·5	**833·3**	62·9	124·6	187·5	1381·5
1933	173·4	223·5	396·9	303·3	259·8	**128·1**	691·2	27·3	141·0	168·3	1256·4
1934	**315·6**	**233·8**	**549·4**	217·6	260·4	114·5	592·5	31·8	147·6	179·4	1321·3
1935	298·1	221·9	520·0	233·5	185·4	69·0	487·9	76·3	119·8	196·1	1204·0
Mean...	230·3	213·7	444·1	203·7	274·0	91·0	528·8	42·7	106·4	149·7	1202·4

[1]) See "Note to Table 10" on p. 21.

Table 11. Num

Year	River Areas						Annual Specimens Total	Tornio Riv	
	Bothnian Bay Area				Southern Area				
	Tornio River	Kemi River	Oulu River	Total	Kokemäki River	Kymi River		Kiviranta	Sumisaari
1920	—	—	52	52	—	238	290	—	
1921	—	—	69	69	—	328	397	—	
1922	—	152	25	177	—	227	404	—	
1923	—	70	110	180	—	148	328	—	
1924	—	75	73	148	—	144	292	—	
1925	—	424	257	**681**	232	355	**1268**	—	
1926	—	220	259	**479**	418	721	**1618**	—	
1927	—	171	679	**850**	195	811	**1856**	—	
1928	—	322	394	**716**	100	594	**1410**	—	
1929	—	587	317	**904**	95	422	**1421**	—	
1930	483	594	471	**1548**	120	260	**1928**	352	1
1931	1032	210	482	**1724**	28	428	**2180**	920	1
1932	498	989	924	**2411**	83	588	**3082**	405	
1933	1055	1542	1014	**3611**	—	117	**3728**	579	4
1934	2237	2502	1369	**6108**	162	317	**6587**	**1954**	2
1935	887	1695	1084	**3666**	172	262	**4100**	710	1
Total...	6192	9553	7579	**23324**	1605	5960	**30889**	4920	12

This table does not include specimens from the Oulu River (Raadinpato weir) taken in 1917—1919. In 1917 308 s mens were taken from a catch of 1117 salmon (specimens thus 27·6 % of the catch). In 1918 66 specimens were taken a catch of 592 salmon (specimens thus 11·1 % of the catch). In 1919 92 specimens were taken from a catch of 539 sa (specimens thus 17·1 % of the catch).

years of 1928 and 1932 appear to have been linked by good intervening years. The sudden drop in the 1934 and 1935 special Polish mielnica statistics nevertheless hints at a new depression of some importance.

I should mention further in making this survey that, as shown by Table 10, the maximum year of 1932 in the Baltic proper was followed *two years later* by a maximum period in the Gulf of Bothnia, or rather, the Bothnian Bay; and that the minimum year of 1924 in the Baltic proper was followed *two years later* by a minimum year in the Bothnian Bay. The minimum year of 1925 in the Baltic proper was followed *two years later* — according to Finnish statistics — by a minimum year in the Bothnian Bay. On the other hand, the maximum year of 1928 in the Baltic proper was followed by no corresponding maximum year in the Bothnian Bay — at least, not in 1930, as might have been expected on the basis of former experiences.

With regard to salmon fishing in the Gulf of Finland, I am unable as yet to refer to the fluctuation phenomenon owing to the insufficiency of the statistics.

For the time being I will conclude my survey based on statistics of catches, but will revert to the subject after dealing with the biological analysis of the composition of year-classes and life-cycles of salmon caught in Finnish waters, provided by the specimen scales and their measurements which I have collected.

Note to Table 10.

I have combined the Esthonian catches of salmon in their entirety with those of the Gulf of Finland district, although since 1931 that part obtained from the western Esthonian provinces, i. e., Lääne, Saare and Pärnumaa provinces, could be separated. The statistics available per province are as follows (in thousands of kilogrammes):

	Viru	Harju	Gulf of Finland	Lääne	Saare	Pärnu	Baltic
1931..	29·4	29·3	58·7	35·9	2·5	2·0	40·4
1932..	59·2	38·9	98·1	18·7	3·3	4·5	26·2
1933..	92·5	37·9	130·4	0·8	0·4	9·4	10·6
1934..	91·0	28·5	119·5	0·9	0·9	26·9	28·9
1935..	78·7	19·0	97·7	0·4	0·8	20·9	22·1

According to the statistics the Esthonian catches of salmon are principally derived from the Gulf of Finland area. The statistics have been kindly supplied by Mr. J. Kodres, Inspector of Fisheries.

ecimens investigated.

Fishing Grounds							Percentages of Numbers from special Statistics				
Kemi River			Oulu River		Kymi River						
Kõngäs	Muurola	Valkeakoski (Sea)	Pyhäkoski Rapids	Maijala Varvikko	Ahvenkoski and Riuninkoski	Langinkoski Rapids	Torpio River	Kemi River	Oulu River	Kokemäki River	Kymi River
—	—	—	52	—	106	132	—	—	—	—	—
—	—	—	69	—	123	205	—	—	9·7	—	55·0
—	—	—	25	—	108	119	—	4·5	4·1	—	19·8
—	—	—	110	—	39	109	—	3·5	29·7	—	14·3
—	—	—	73	—	—	144	—	5·4	11·1	—	23·2
—	—	—	257	—	145	210	—	24·1	36·9	39·3	68·5
—	—	—	173	86	271	450	—	21·8	50·4	96·3	99·4
—	—	—	488	191	322	489	—	9·7	55·2	95·1	99·8
—	258	—	394	—	247	347	—	23·7	85·8	94·3	99·7
—	—	217	317	—	127	295	—	42·5	94·1	93·1	99·8
—	—	—	471	—	107	153	27·3	32·4	83·2	98·4	99·6
—	—	188	482	—	128	300	77·2	57·4	99·6	100·0	99·3
65	27	711	924	—	190	398	53·6	126·8[1])	85·6	109·2	100·0
142	73	1327	**1014**	—	96	21	70·9	323·3[1])	77·3	—	98·3
408	378	**1716**	**1172**	197	111	206	66·7	163·0[1])	84·8	92·6	128·3[2])
167	508	1020	809	275	78	184	60·2	128·9[1])	100·0	91·5	97·4
782	1244	5179	6830	749	2198	3762	—	—	—	—	—

Percentage figures exceeding 100 are due to the fact that no special statistics are obtained from the catches of the Valkeakari salmon fishing ıor in general from those of other fishing grounds at the mouth of the Kemi river, unless the numbers derived from scale specimens be taken into vhich is not the case.

Percentage figures exceeding 100 are caused by certain samples taken from outside the mouth of the river.

II. Year and Life-Cycle Classes in Finnish Catches of Salmon.

1. Introduction.

The biological analysis of salmon which is presented in this work is founded, as mentioned before, on measurements and weighings carried out at certain fishing grounds, combined with the collecting of scale specimens. With the exception of the Valkeakari fishing grounds at the mouth of the Kemi River, all these fishing grounds are hired out by the state and have contributed information for the "special statistics", i. e. those given in Table 3. The salmon from which specimen scales have been taken thus form a part, and in many cases a considerable part, of the salmon included in the special statistics. It must nevertheless be pointed out that the Simo and Ii-Haukipudas sea areas, which are rich in salmon, are not represented in this respect.

The number of specimen salmon, i. e., salmon that have been under analysis, from the various fishing grounds and the ratio of their number to the catches shown in Table 3 are given in Table 11. It should be mentioned here that specimens and measurements are confined to a total of 30,889 salmon, or, if the collections and measurements of the Oulu River in 1917—1919 be taken into account, 31,225 salmon. These fish have been distributed among the various fishing areas as follows. Tornio 1930—35: 6,192, Kemi 1922—35: 9,553, Oulu 1917—35: 8,045, Kokemäki (Pori) 1925—35: 1,605, and Kymi 1920—35: 5,960 salmon.

I have given my results in two series of tables, of which one — Tables 12—18 — shows the figures in respect of the age and life-cycle classes (as numbers and percentages) given by specimens collected from various areas, each year separately. The second series — Tables 19—26 — is intended to provide a comparative survey of the duration of the smolt-age and migratory period as well as of the number of salmon which have ascended the rivers previously at the various salmon areas. This series also includes the tables showing the numbers of individuals in the age and year-classes among the specimens, not taking into consideration the phases of the life-cycles — Tables 23—27.

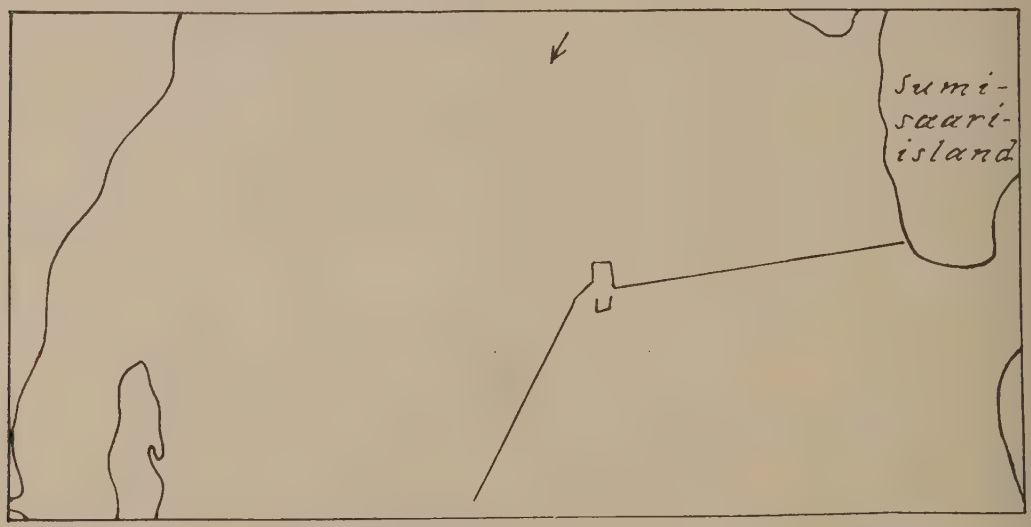

Fig. 5. Plan of Sumisaari Weir (Tornio River).

2. Survey of Fishing Methods employed at Grounds supplying Samples.

Tornio River. Salmon fishing is still carried on in the river by means of four large weirs, known according to their sites as the Kiviranta, Sumisaari, Paasi and Marjosaari weirs. Collections of scales and their measuring and weighing were carried out at the first two weirs mentioned above, both on the lower reaches of the river, the Kiviranta weir immediately above the town of Tornio on the opposite bank, and the Sumisaari weir some little distance above. Both these are so-called "pen-weirs".

Kemi River. Collections were made in this river until the summer of 1932 at the Korva pen-weir. The efficiency of this weir was nevertheless impaired by the increasing timber-floating operations, and it was finally abandoned. The main collection was subsequently made, since 1931, at the Valkeakari fishing grounds at the mouth of the river, where the first collections had been made in 1929, and at the Muurola and the Köngäs weirs. Salmon were caught at the Valkeakari fishing grounds by means of large fykes and similar contraptions placed in the sea.

Oulu River. Specimens were collected from the Raatti weir in 1917—1919, but since 1920 from various places at the Pyhäkoski Rapids, and since 1934 also at the Maijala or Varvikko netting places.

Kokemäki River. All specimen scales collected are from Lukkarinsanta immediately above the town of Pori on the south bank of the river. The seine is drawn at strictly regulated and marked places in the river, known as "legal netting grounds".

Kymi River. Salmon are caught at the Langinkoski Rapids at artificially constructed backwashes at the sides of the rapids. There is one of these at either bank and they have been constructed below caissons sunk with stones into the bed of the river. These backwashes are tried from time to time with a small seine dragged by two men.

At Ränninkoski and Siikasaarinkoski Rapids fish-traps set in the weirs are generally employed. The fish-traps are constructed in the form of box-shaped chests of wooden poles. At Ränninkoski Rapids the weirs are triangular in shape covering half the width of the rapids and supported by caissons sunk in the bed of the river. The salmon are caught at the outer corner in the same way as at the Langinkoski backwater. At Siikasaari, on the other hand, the weir blocks the eastern area of the rapids.

At Ahvenkoski where previous to August 1931 the water flowed through several separate arms of the river, weirs are built across the rapids at different fronts. Here similar fish-traps to those in use at the Siikasaari and Ränninkoski weirs are employed. The Ahvenkoski fishing grounds have subsequently been abandoned as in 1931 the lower reaches of the river were dammed for power supply purposes.

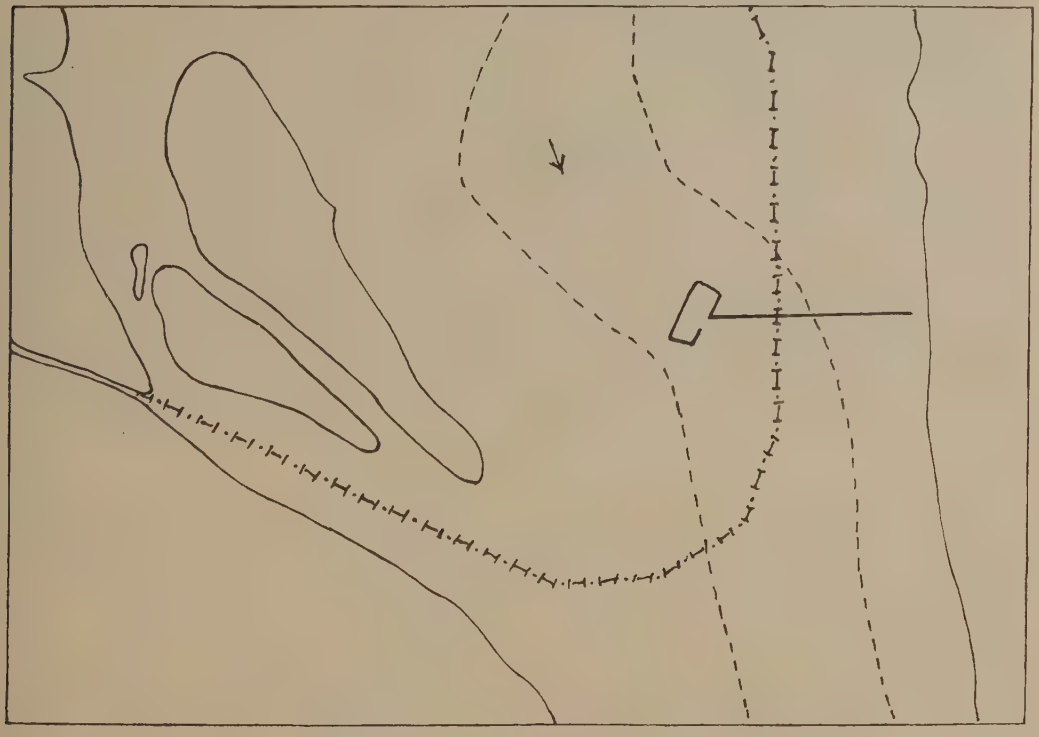

Fig. 6. Plan of Kiviranta Weir (Tornio River). — — — — — — — = The deepest part of the river, the so-called main channel. ⊢ · ⊢ · ⊢ · ⊢ · = The Finnish-Swedish frontier (fishing grounds shared by both countries).

Fig. 7. A few minutes Rest at a Corner of the Kiviranta Weir after hauling in the Seine.

Fig. 8. Plan of the Muurola Weir (Kemi River).

Fig. 10. Pen at Muurola Weir, Seine being dragged in Direction of Current in the Pen.

I have published an earlier account (Järvi 1932, 1934) of these fixed fishing contrivances in Finland, which I append here in an abbreviated form:—

The weirs used in the rivers vary considerably with different districts. If we begin with the extreme northern salmon area we find even there two different types of large weirs in use: the so-called pen-weir and the fyke-weir. Of these the former is the older.

In both these types the weir itself, or rather, the back of the weir, is designed partly to prevent the salmon ascending the river, and partly to guide those salmon that have become trapped under the weir to

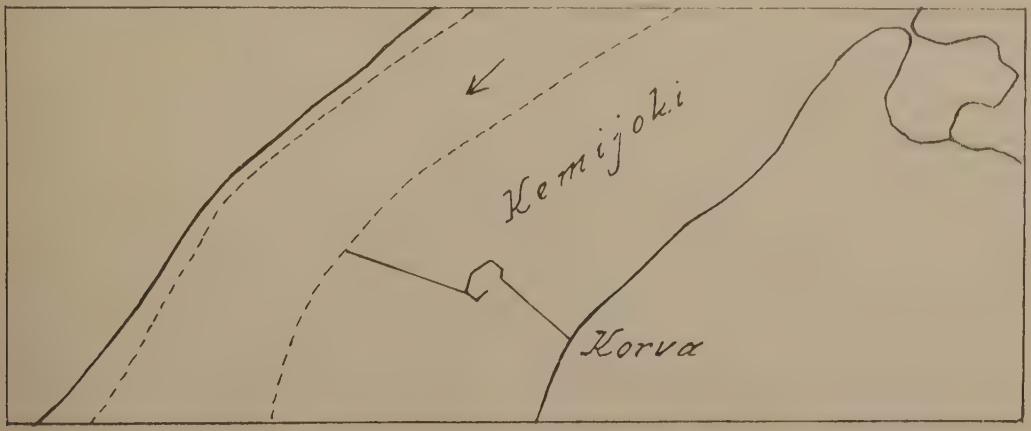

Fig. 9. Plan of the Korva Weir (Kemi River).

Fig. 11. Lifting the Seine and opposed Seine at the lower edge of the Muurola Weir Pen.

Fig. 12. The Korva Weir and Pen (Kemi River). Photographed from the upper corner of the pen.

Fig. 13. Lifting the Catch at the lower side of the Korva Weir Pen.

a certain point or points where they can be caught. In the pen-weirs the ascending salmon have to enter the so-called pen, and in other weirs the fyke or other catching apparatus placed in the weir. The pen is a fairly large fence placed in a suitable, i. e. a deep and fairly rapid part of the river. The salmon guided by the wings of the weir enter the pen via the entrances, but once in the pen in their efforts to ascend the river they can no longer find the outlet. The position of the pen in the weir is of very great importance. It is essential that the flow of the current through the entrance to the pen be sufficiently strong so that it is easily perceptible to the fish as it approaches the entrance. It often happens that the parts of the weir

Fig. 14 a. Plan of the Köngäs Fyke-Weir (Kemi River).

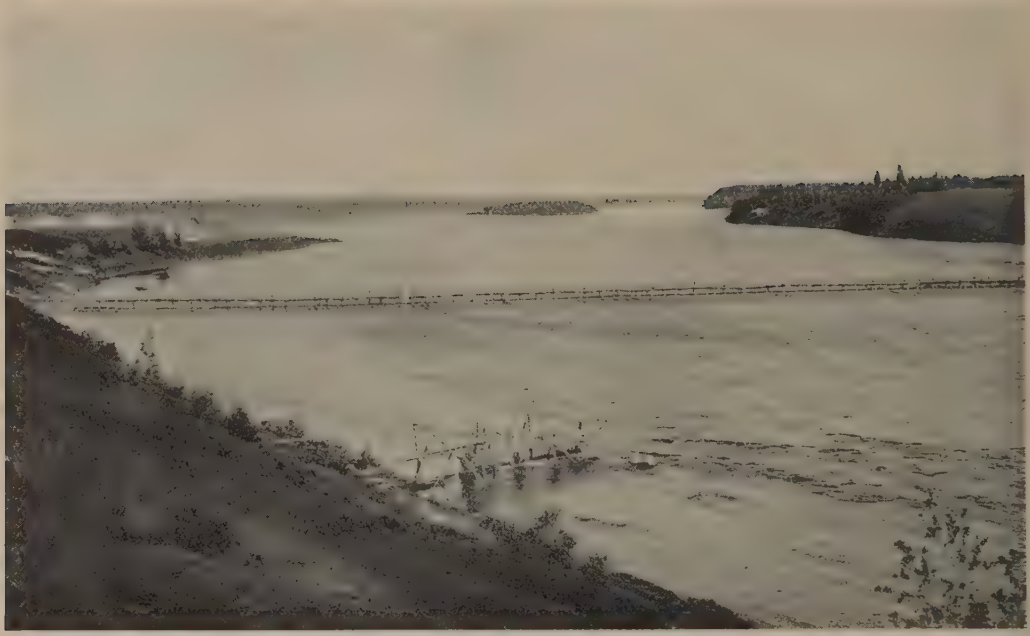

Fig. 14b. Köngäs Fyke-Weir at the Point where the Kemi River branches. Small Bank Weir in Foreground.

Fig. 15. Part of the Pyhäkoski Rapids in Oulu River. On the left side a fishing site with Weirs.

Fig. 16. Part of the Niskakoski Rapids in Oulu River.

Fig. 17. Leppiniemi Fishing Site on the Pyhäkoski Rapids (Oulu River).

Fig. 18. Plan of Ränninkoski Fishing Grounds in Kymi River.

connected to the upper edge of the pen must be altered and rearranged so that suitable currents enter the pen which can act as an artificial back-wash, forming a resting-place for the fish. The lifting of the salmon from the pens, of which, by the way, there is only one per weir, is done with a certain kind of drift-net (seine), a so-called "kulle". This "kulle" is a large-meshed, but strong, net, the bottom edge of which is formed by an iron chain. It is thrown in at the upper end of the pen and drawn across the current to the lower end. At this end there is another net along the wall of the pen. The seine drives the salmon before it into this other net. The seine and the net are then lifted together into the boat from the lower end of the pen. The salmon thus obtained are caught between the two nets.

In the fyke-weirs, the salmon ascend through the openings in the walls of the weir to the fykes situated at the back of the openings, or they are forced backwards into net bags, placed down stream. The water presses against them in these bags and hinders their movements.

The weirs of northern Finland are always rebuilt every year and are supported by stakes. This is the only possibility in rivers where the spring floods drive all obstacles from their path on the breaking-up of the ice. The stakes are driven into the bed of the river obliquely against the current, and are supported by other stakes slanting in the opposite direction, thus forming a kind of trestle resembling a slightly concave bridge of long thin saplings. Large stones are then placed on the bridge to provide the weir with sufficient strength to resist the current. The wall of the weir itself is closed in different ways, depending on the strength of the current, either by poles made from small pine trees and bound closely together or by placing young fir shoots into the river upside down (e. g. Korva weir). In the slowest currents and streams (Muurola and Muhos weirs) string, wide-meshed nets are, or were, used.

Only three pen weirs are in use at present — the Kiviranta and Sumisaari weirs, which I have mentioned before, situated close to each other near the mouth of the Tornio River, and the Muurola weir at Rovaniemi, more than 120 km. from the mouth of the Kemi River. At the beginning of the century there were still seven pen-weirs in use along the Tornio River, but these were discontinued in 1920. At this time there were also five pen-weirs in the Kemi River; the last but one, the Korva weir, being used for the last time in the summer of 1932.

At present there are two fyke-weirs employed in the Tornio River (Paasi and Marjosaari), one in the Kemi River (Köngäs) and three in the Ii River (Illinkoski, Venäjänkari and Haukka). The Raati and Muhos weirs in the Oulu River were used for the last time in the summer of 1919.

In addition to these large weirs, small, so-called shore-weirs are used particularly in the Tornio and Kemi Rivers. These are short weirs usually built only for the spring floods at different points along the rapids. They usually consist of a bridge laid across trestles and weighed with stones, and a wall of young fir shoots. There are generally two or three openings in the wall; the trap is a fyke.

Since the large weirs in the Oulu River were abandoned salmon fishing in that river, subsequent to 1920, has been carried out principally at six points along the Pyhäkoski Rapids; of these the best-known is Leppiniemi. These fishing grounds are formed from artificial backwaters. A fairly short bridge weir is built over a row of trestles from the side of the river; a weir wall is made supported by the foremost row of trestles. The purpose of this wall is to regulate the quantity of water flowing under the weir, as the flow must be even and attract the salmon. A special platform is constructed on the back row of trestles, for the seine which, when necessary, can be quickly thrown into the water. The fishing itself is as follows:— during the summer season the fishermen take turns in sitting all hours of the day and night on the high banks of the river above the fishing grounds, watching for changes in the flow of the river. On noting a change in the flow the watcher knows that a salmon in the foam of the rapids has come under the weir; the net is then cast from the platform as quickly as possible and drawn to the bank below the weir.

It is probable that since the years 1914—1917 no salmon weirs have been constructed in the Kokemäki River, although at the beginning of the century several different types of weirs were still in use in the lower reaches of the river. Fishing in this river is done with a seine at carefully specified places where no more than half the width of the river may be covered.

The fixed salmon fishing apparatus employed in the Kymi River are unusual in that they are built

Fig. 19. Ränninkoski Fishing Apparatus in Kymi River.

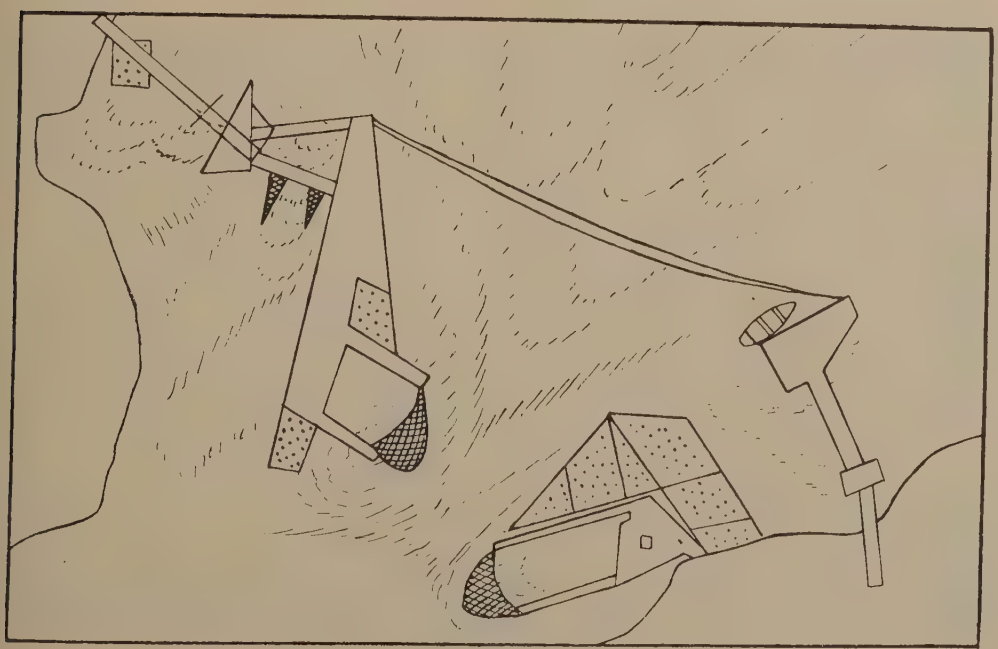

Fig. 20. Plan of the Langinkoski Rapids Fishing Apparatus in the Kymi River.

Fig. 21. Fishing with Salmon-fishing Apparatus on the left side of the Rapids.

Fig. 22. Fish Trap at Siikasaari Rapids (Kymi River).

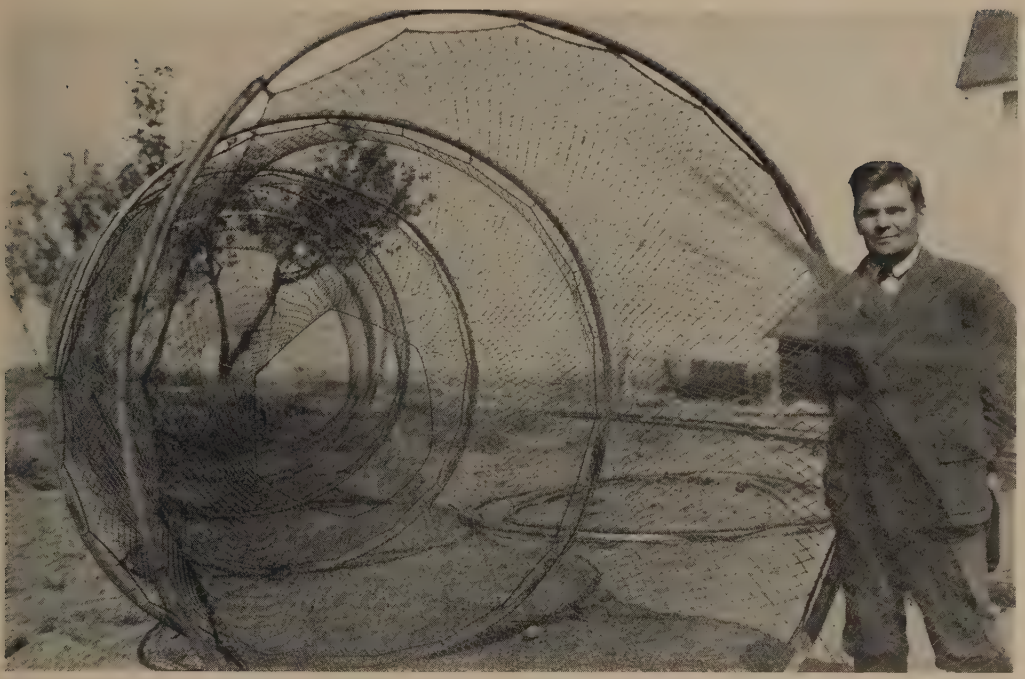

Fig. 23. Large Fyke-Net for Sea Fishing (Kemi, Valkeakari).

on permanent caissons sunk in the river, i. e., usually triangular (but sometimes square) frames of beams are sunk in the river and extend for some distance above the surface of the water. These frames are then filled with large stones. These caissons are strong enough to withstand the pressure of the drifting ice and can be used for a long time. The fixed fishing contrivances in these parts are either enclosures supported by one caisson, or large weir "yards" supported by several caissons placed in rows. Of this latter type two are at present in use — the Siikasaari and Ränninkoski weirs already referred to. The small artificial enclosures situated on either bank of the Langinkoski Rapids are both of the former type.

In former times salmon fishing at sea was practised on a very small scale in Finland, but since the latter half of the 19th century it has developed and improved considerably. The development in salmon fishing at sea has been influenced largely by technical improvements in catching methods. Nowadays salmon are caught at sea almost entirely by means of large fyke-nets usually placed one after the other in so-called "designs".

The most important centres of salmon fishing by the above means are the estuaries of the Tornio and Kemi Rivers, then the fishing waters of Maksniemi, and finally Simoniemi. The importance of the Maksniemi grounds is due to their favourable position in relation to the mouth of the Kemi River. A long cape stretching far out into the sea acts as a collector of salmon which have arrived at the shores to the south of the Kemi River too early. The best known of the Maksniemi fishing places are the so-called Röyttä and Halttari grounds.

Salmon fishing of any importance off the shores of the Gulf of Finland is only that done with large fyke-nets at the estuary of the Kymi River. The catch at other places is small, although some salmon fishing is practised at other parts of the eastern end of the Gulf of Finland.

During winter salmon are caught from only two very restricted areas in Finland — outside the towns of Pori and Kaskinen — both on the coast of the Bothnian Sea and at no great distance from each other.

Fig. 24. Large Fyke-Net during Low Water (Jakobstad, Öregrund).

3. Grouping of Salmon into Life-Cycle Classes.

The division of salmon into life-cycle classes begins immediately on the individuals of a certain year-class starting their migration, as the departure from the breeding rivers is made at different ages. Subsequently the number of life-cycle classes grows considerably, as the salmon remain for different periods on their first migration and ascend and spawn for the first time — if their life-time is sufficient — at different ages. As in addition to this there are a certain number of salmon attempting to spawn for the second, third and fourth time, the number of the life-cycle classes finally becomes fairly considerable.

In marking the life-cycle classes I have used the abbreviated number and letter markings fixed by the Salmon and Trout Committee of the International Council for the Exploration of the Sea at the meeting held in Gdynia in 1933 (Rapp. et Proc.-Verb., Vol. XCI). With regard to the special terms, I have used those given on p. 12 of a list published by the present author in collaboration with Mr. W. J. M. Menzies in 1936 (Rapp. et Proc.-Verb., Vol. XCVII).

In order to determine the ratio between the various migratory periods and the age of the salmon, I have appended the following table, which will provide a general illustration of these ratios as regards certain of the more common life-cycle classes.

Ratios between the Life-Cycle Classes, the Age and the Ascending Years.

Description	Age	Ascending Year
a. First time ascending:		
3.1+	4 years	the fifth
3.2+	5 years	the sixth
3.3 and 3.3+	6 years	the seventh
3.4 and 3.4+	7 years	the eighth
3.5	8 years	the ninth
b. Second time ascending:		
3.1+G1	6 years	the seventh
3.1+G2	7 years	the eighth
3.2+G1	7 years	the eighth
3.3G1	8 years	the ninth
3.4G1	9 years	the tenth
c. Third time ascending:		
3.1+G1G1	8 years	the ninth
3.1+G2G1	9 years	the tenth
3.2+G1G1	9 years	the tenth
3.3G1G1	10 years	the eleventh
3.4G1G1	11 years	the twelfth
d. Fourth time ascending:		
3.3G1G1G1	12 years	the thirteenth
3.4G1G1G1	13 years	the fourteenth

When smolt-age is 2. or 4., the Age and Ascending Year will be one year less or more, respectively.

In certain surveys I have combined the life-cycle classes into special groups, by disregarding the divergencies in the year-classes of the smolt-age. In these cases I have used the designation A.1+, A.2+, A.3+, etc. In certain other cases I have disregarded the stages subsequent to the smolt-age, and have then used the designations: 2.B, 3.B, etc.

The majority of life-cycle classes are of no importance from the point of view of the catch formation, as the number of individuals belonging to them is small; some of those life-cycle classes are so insignificant in their number of individuals that representatives of such classes are not met with every year. Other life-cycle classes, on the other hand, regularly make their appearance, but are nevertheless, as regards the catch, only supplementary to the life-cycle classes which, taking the large majorities of individual salmon, absolutely determine the number of individuals and at the same time the quantity of salmon caught. *These chief life-cycle classes naturally also show the usual lives of individual salmon and are therefore deserving of attention from a commercial, as well as a biological, point of view.*

The division of investigated salmon into life-cycle classes is given in detail — both as regards quantity and inter-relationship — in Tables 12—17. Table 18 gives a summary of the life-cycle classes attempting to spawn for the first time, but which have become caught.

4. The most important Life-Cycle Classes.

A. Smolt-Age.

According to the length of their smolt-age the salmon with which my specimen scales are concerned, are divided as follows:—

	Number						Percentage				
Smolt-Age (years)	1.B	2.B	3.B	4.B	5.B	Total	1.B	2.B	3.B	4.B	5.B
Tornio (1930—35)	—	100	**4258**	1737	97	6192	—	1·6	**68·8**	28·0	1·6
Kemi (1922—35)	—	820	**7443**	1255	35	9553	—	8·6	**77·9**	13·1	0·4
Oulu (1917—35)	—	1152	**6155**	726	12	8045	—	14·3	**76·5**	9·0	0·2
Kokemäki (1925—35)	1	**1373**	228	3	—	1605	0·1	**85·5**	14·2	0·2	—
Kymi (1920—35)	28	**5216**	711	5	—	5960	0·5	**87·5**	11·9	0·1	—

Taking into consideration later points raised in this work I have made the following summaries:—

	Number					Percentage			
	2.B	3.B	4.B	5.B	Total	2.B	3.B	4.B	5.B
Tornio + Kemi area	920	**11701**	2992	132	15745	5·9	**74·3**	19·0	0·8
above + Oulu	2072	**17856**	3718	144	23790	8·7	**75·1**	15·6	0·6
Kokemäki + Kymi	**6589**	939	8	—	7565[1])	**87·1**	12·4	0·1	—

[1]) Of these 29 individuals or 0·4% are one year old.

The varying smolt-age of those salmon which have returned to the rivers (or the river mouths, as in the case of the Valkeakari fishing grounds in the Kemi area) is, of course, proof of the fact that the salmon or, at least, the majority of salmon, return to their original breeding rivers to spawn. The varying periods of open water due to the different geographical position of the breeding rivers are thus apparent in the ages of the salmon ascending the rivers. It should be mentioned, perhaps, that at the Kaihua hatcheries on the Kemi River (at Rovaniemi) the time of incubation of eggs is very long, the alevins begin to appear in May, but their evolution is slow so that their umbilical sac disappears in June only; the newly hatched fry are generally bedded until the latter half of June. This being so the first growing season is reduced to about four months as the water is generally frozen already in November. Of these four months only two — July and August — are real summer, the others being autumn months. The length and weight of parr of one summer's growth from a certain part at the Kaihua fishing hatcheries in 1928 were 4·4—7·9cm. (average length 5·54cm.) and 0·9—4·7gr. (average weight 1·91gr.) out of 19 fish measured and weighed.

Contrasts in the smolt-age of salmon ascending the Finnish rivers are, as will be seen from the above summary, fairly great in the most northerly rivers of the country — the Tornio, Kemi and Oulu Rivers — when compared with the rivers further to the south — the Kokemäki and Kymi Rivers. In the northern rivers the great majority is formed by salmon which have lived three parr years: Tornio River 68·8%, Kemi River 77·9% and Oulu River 76·5%. As regards salmon in the more southern rivers the great majority, on the other hand, is formed by fish that have only spent two parr years in their breeding rivers: Kokemäki River 85·5% and Kymi River 87·5%. These ratios vary year by year, as can be seen from Table 19, pp. 60/61.

Life-cycle classes of salmon which have spent four years in the river before descending to the sea are present in great numbers in the Tornio River where they average 28%, varying between 27 and 33%. Salmon of four years smolt-age were also above the

average in the Kemi River in 1932 (26·2%) and in the Oulu River in 1932 and 1933 (15—16%).

Salmon of two years smolt-age are present in the Tornio River in insignificant numbers — at the maximum 2% — slightly more in the Kemi area, i. e. 6—10%, although sometimes fairly abundantly, as for instance in the Kemi River in 1933 there were found 275, i. e. 17·8%, and in the Oulu River during the same year 215, i. e. 21·2%. Even rarer than the last-mentioned — less than 1% — are individual salmon whose smolt-age has lasted five years ascending even the most northern rivers; the 69, i. e. 3·1%, found in the Tornio River in 1934 should be mentioned as an exception.

Owing to the fact that the great majority of salmon in the southern rivers of Finland — the Kokemäki and Kymi Rivers — are of two years smolt-age, a supplementary group is formed in these rivers by fish of three years smolt-age, varying in the Kymi River (which provides more material for samples) between about 7% and 16%; occasionally, as in 1930 and 1935 even slightly more.

It is interesting to compare the above lengths of smolt-ages of salmon caught in Finnish waters with those concerning the Swedish rivers, principally the ones entering the Gulf of Bothnia (to the Bothnian Sea and the Bothnian Bay) published by Rosén (1918) and Alm (1934). The figures based on their data are as follows:—

Rosén:

	Number					Percentage			
	2.B	3.B	4.B	5.B	Total	2.B	3.B	4.B	5.B
Tornio (1916)	1	16	4	—	**21**	4·8	**76·2**	19·0	—
Kalix (1915—1916)	1	16	13	—	**30**	3·3	**53·3**	43·3	—
Lule (1915)	16	88	69	4	**177**	9·0	**49·7**	39·0	2·3
Pite (1915)	3	30	24	—	**57**	5·3	**52·6**	43·3	—
Total...	21	150	110	4	**285**	7·4	**52·6**	38·6	1·4
Ume (1916)	79	63	4	—	**146**	**54·1**	43·2	2·7	—

Alm:

	Number						Percentage				
	1.B	2.B	3.B	4.B	5.B	Total	1.B	2.B.	3.B	4.B	5.B
Kalix (1928—31)	—	23	136	39	1	**199**	—	11·6	**68·3**	19·6	0·5
Lule (1928—31)	—	28	113	20	—	**161**	—	17·4	**70·2**	12·4	—
Total...		51	249	59	1	**360**	—	14·2	**69·2**	16·4	0·2
Ume (1930—31)	—	45	98	6	—	**149**	—	30·2	**65·8**	4·0	—
Ångerman (1925—28, 1931)	—	143	285	8	—	**436**	—	32·8	**65·3**	1·9	—
Indal (1927—29, 1931—32)	—	140	206	4	—	**350**	—	40·0	**58·9**	1·1	—
Ljung (1926—27)	—	34	20	—	—	**54**	—	**63·0**	37·0	—	—
Total...		362	609	18	—	**989**	—	36·6	**61·6**	1·8	—
Ljusne (1926—27, 1930—32)	—	196	183	6		**385**	—	**50·9**	47·5	1·6	—
Dal (1928—27)	—	134	77	2	—	**213**	—	**62·9**	36·2	0·9	—
Total...		330	260	8	—	**598**	—	**55·2**	43·5	1·3	—
Mörrum (1916)	2	61	17	—	—	**80**	1·5	**76·5**	22·0	—	—
— (1926—29, 1931—32)	34	365	56	—	—	**455**	7·5	**80·2**	12·3	—	—
Total...	36	426	73	—	—	**535**	6·7	**79·6**	13·7	—	—

Before studying Rosén's and Alm's figures of the average lengths of smolt-ages of salmon ascending the Swedish rivers, attention should be drawn to the geographical situation of the Swedish rivers compared with those of Finland. The Tornio River forms the frontier between both countries, and is at the same time, both as regards its outlet and upper reaches, the most northerly river. The mouth of the Kemi River is near to that of the Tornio River, while the mouth of the Kalix River is at the same latitude; the Lule River is also almost on the same level. The Pite River in Sweden corresponds to the Ii River in Finland, but I have not investigated salmon ascending this latter river. The mouth of the Oulu River is more to the south; the smolt-age of salmon ascending this river can nevertheless be compared to the results

obtained from the Pite River. The Ume River flows into Merenkurkku (Quarken). There is no corresponding river on the Finnish side. This is also the case with the Ångerman, Indal and Lungan Rivers. The Kokemäki River in the south of Finland enters the Bothnian Sea at the same latitude as the Ljusne River in Sweden, while the Dal River in the latter country flows into the sea much more to the south. The Mörrum and Kymi Rivers can hardly be compared with one another, as the former enters the western arm of the Baltic far from the other rivers mentioned above.

A comparison of Rosén's and Alm's figures on the length of smolt-ages with those which I obtained from samples collected in the Bothnian Bay northern salmon area, will show noticeable divergencies. Rosén's four-year-smolt ascending the Kalix and Lule Rivers predominate to a greater extent than my observations concerning the Tornio and Kemi Rivers. Two-year-smolt ages in Alm's figures, on the other hand, are present in greater numbers than was found to be the case in this investigation. It is probable that these divergencies have been brought about to a certain degree by the phenomenon of fluctuation, so that too much weight should not be attached to them. As regards the Kokemäki and Kymi Rivers the two-year-smolt predominate to a greater extent (85—87%) than in the Ljung, Lusne and Dal Rivers (51—63%).

If we combine the various observations on the above lengths of smolt-ages according to the different sea areas (the Ume River is taken as belonging to the Bothnian Sea) we get:—

Data which can be used for purposes of comparison as regards the length of smolt-ages have also been published on the southern parts of the Baltic. Dixon (1931, 1934) has investigated salmon from the Gulf of Danzig and neighbouring waters (464 fish), Willer and Quednau (1934) the coast of East Prussia outside Kuhrische Nährung (Neukuhren, 1127 fish).

Their results are as shown on page 38, top.

An examination of these figures indicating the smolt-ages of salmon caught in the southern areas of the Baltic shows that the division of the fish into the various smolt-age classes most nearly corresponds to the figures for Bothnian Bay salmon, as in the majority of cases (63·9%) the smolt-age has been three years. This fact has also been observed by Dixon, Willer and Quednau, who have expressed the opinion that for the main part salmon caught in the southern parts of the Baltic have originated in the northern areas.

The smolt-age of the salmon indeed demonstrates very clearly the great importance of the rivers flowing into the most northerly part of the Gulf of Bothnia — the Bothnian Bay — in maintaining the stock of salmon in the southern as well as the northern parts of the Baltic.

The varying composition of smolt-ages obtained by Dixon in 1928 and 1933 with different fishing appliances — net and hook — is unexpected, although it probably should not be afforded too much attention at present as the divergencies are based on insufficient data, and may therefore be purely circumstantial.

Bothnian Bay:	Number					Percentage			
	2.B	3.B	4.B	5.B	Total	2.B	3.B	4.B	5.B
Finland	2072	17856	3718	144	**23790**	8·7	**75·1**	15·6	0·6
Sweden	72	399	169	5	**645**	11·2	**61·9**	26·2	0·7
Total...	2144	18255	3887	149	**24435**	8·8	**74·7**	15·9	0·6

Bothnian Sea:	1.B						1.B				
Finland	1	1373	228	3	—	**1605**	0·1	**85·5**	14·2	9·0	—
Sweden	—	771	932	30	—	**1733**	—	44·5	**53·8**	1·7	—
Total...	1	2144	1160	33	—	**3338**	0·02	**64·2**	34·8	1·0	—

The figures in the above table representing Bothnian Bay salmon are naturally based — owing to the great disparity in the data — on observations published in this paper. According to the table the difference between the length of smolt-ages in the Bothnian Bay and the Bothnian Sea is considerable. Three-year-smolt-ages are in majority by almost three-fourths in the Bothnian Bay. As regards salmon ascending the rivers from the Bothnian Sea, salmon of two-year-smolt-age easily predominate on the Finnish side, whereas on the Swedish side there is almost a corresponding minority (44·5%), salmon of three-year-smolt-age just predominating — 53·8%.

B. First Migratory Period.

It is known that usually the first migratory period of salmon is of longer duration than subsequent migrations, and it is probable that these first migrations cover a greater distance than later ones.

According to the data which I have collected the salmon returning to the Finnish salmon areas for the first time have spent the following different periods on migration (+ indicates the summer of ascent and the figure the preceding complete migratory years). Salmon arrive at the Finnish salmon areas generally during June and July.

(See page 38, middle.)

DIXON: Series A: Salmon caught with drift-net:

	Number					Percentage			
	2.B	3.B	4.B	5.B		2.B	3.B.	4.B	5.B
1928	14	69	17	—	**100**	14·0	**69·0**	17·0	—
1931	9	123	44	—	**176**	5·0	**70·0**	25·0	—
1932	13	46	30	1	**90**	15·0	**51·0**	33·1	1·0
1933	6	75	16	1	**98**	6·0	**77·0**	16·0	1·0
Combined...	42	313	107	2	**464**	9·0	**67·5**	23·1	0·4
DIXON: Series B: Salmon caught with hooks:									
1928	12	14	4	—	**30**	40·0	**47·0**	13·0	—
1933	26	41	—	—	**67**	39·0	**61·0**	—	—
Combined...	38	55	4	—	**97**	39·0	**57·0**	4·0	—
WILLER and QUEDNAU:									
1928/29	8	55	32	1	**96**	8·3	**57·3**	33·3	1·1
1929/30	49	213	81	5	**348**	14·1	**61·2**	23·3	1·4
1930/31	45	442	190	6	**683**	6·6	**64·7**	27·8	0·9
Combined...	102	710	303	12	**1127**	9·0	**63·0**	26·9	1·1
All observations (DIXON, WILLER and QUEDNAU):									
1928—31	182	1078	414	14	**1688**	10·8	**63·9**	24·5	0·8

	A.+	A.1+	A.2+	A.3+	A.4+	A.5+	A.6+	Total	Total Specimens
				Number of Individuals					
Tornio (1930—35)	9	1578	2397	1803	192	22	—	6001	6192
Kemi (1922—35)	11	443	2515	5266	699	75	—	9009	9615
Oulu (1917—35)	4	393	1036	5045	1126	79	2	7685	8045
Kokemäki (1925—35)	—	4	107	975	256	10	—	1352	1605
Kymi (1920—35)	—	510	1834	2637	402	6	—	5389	5960
				or in Percentage					
Tornio	0·1	25·5	**38·7**	29·1	3·1	0·4	—	96·9	
Kemi	0·1	4·6	26·2	**54·8**	7·2	0·8	—	93·7	
Oulu	0·05	4·9	12·9	**62·7**	14·0	1·0	0·02	95·5	
Kokemäki	—	0·2	6·7	**60·7**	15·9	0·7	—	84·2	
Kymi	—	8·0	30·8	**44·2**	6·7	0·1	—	90·4	

The above figures provide a basis for the following table of the Bothnian Bay northern salmon area (i. e., the combined Tornio, Kemi and Oulu areas), and of the salmon rivers of southern Finland (Kokemäki and Kymi Rivers):—

The figures for the various fishing grounds in the Kymi River go to show the similarity or divergence between the catches at different fishing grounds in the same river:

(See page 39.)

	A.+	A.1+	A.2+	A.3+	A.4+	A.5+	A.6+	Total	Total Specimens
				Number of Individuals					
Bothnian Bay area	24	2414	5948	12114	2017	156	2	22695	23852
Southern Finnish Rivers	—	514	1941	3612	658	16	—	6741	7565
				or in Percentage					
Bothnian Bay area	0·1	10·1	24·9	**50·8**	8·5	0·6	0·01	95·0	
Southern Finnish Rivers	—	6·8	25·7	**47·7**	8·7	0·2	—	89·1	

	A.1+	A.2+	A.3+	A.4+	A.5+	Total	Total Specimens
			Number of Individuals				
Ahvenkoski Rapids (1920—23)	43	125	168	4	—	340	376
Ränninkoski Rapids (1920—35)	134	609	815	102	—	1660	1822
Langinkoski Rapids (1920—35)	333	1100	1654	296	6	3389	3762
Total...	510	1834	2637	402	6	5389	5960
			or in Percentage				
Ahvenkoski	11·4	33·2	44·7	1·1	—	90·4	
Ränninkoski	7·4	33·2	44·7	5·6	—	91·1	
Langinkoski	8·9	29·2	44·0	7·9	0·1	90·1	

Several noteworthy facts may be decided from the above surveys. First of all, that very rarely are salmon that have ascended after having spent their first migratory year obtained at the main Finnish salmon fishing grounds. A few of these, however, have made their appearance at, for instance, the mouth of the Kemi River (Valkeakari fishing ground, 11 salmon), and have ascended to the lower end of the lower reaches of the Tornio River (Kiviranta weir, 9 salmon). I am nevertheless aware that these small salmon are still caught — unfortunately this is still allowed by law — at the eastern end of the Gulf of Finland, although in small quantities. My detailed investigations have not yet included this area, but the above is shown by the fact that marked salmon have been caught there while still at this stage.

On the other hand, the life-cycle class that spends its second summer on migration, regularly makes its appearance to ascend the rivers.

These small salmon — which have their own particular name in several languages (Finnish "Kossi" English "Grilse") — generally ascend the Finnish rivers in August, certain individuals making their appearance already in July. The share of this life-cycle group A.1+ (owing to the variations in the smolt age there are naturally several life-cycle classes) in the catches is small during normal salmon years, both as regards its individual numbers and its percentage of the whole catch, as the fish belonging to this group are generally of light weight — an average of about 1·5 kg. A peculiarity will be seen, however, from my summary, in that during the years 1930—1935 the A.1+ group, or the so-called grilse, ascended the lower reaches of the Tornio River in very large numbers — no less than 25·5% of the entire individual number of salmon caught — whereas the proportion of this same migratory group in other areas, among others the nearby Kemi area, was extremely small (1—5%). I am unable to provide an absolutely satisfactory explanation of these variations in percentage: the explanation nevertheless lies partly in the fact that the collecting of samples of these small salmon in neither the Kemi nor the Oulu Rivers was, despite my instructions, anything like so carefully made as that of the larger salmon (collectors have advised me of this in certain years). The disparity in the percentages — on the one hand 25 and on the other only 4 or 5 — is nevertheless so great that it may have been caused by peculiar ecological conditions. The disproportion between the percentages may be ascribable also to the fact that salmon fishing in the Tornio River (at the Kiviranta weir) is carried on for a much longer period (up to the end of August) than, for example, in the estuary of the Kemi River. In any case, the proportion of this life-cycle class (A.1+) to the Kemi area catch does not alter, if the catches of the same years that are available as regards the Tornio River, are taken into consideration. In the specimens from the Kemi area for 1930—1935 the migratory group A.1+ is represented by a total of 346 fish, i. e., 4·6% of the total — 7,532.

It appears from the numbers of the general summary that the principal factor in the catches from the Kemi, Oulu, Kokemäki and even the Kymi River has been the life-cycle group: A.3+, which, on having spent three years on migration, endeavours to ascend the rivers. The share of this life-cycle group in forming the catches was (according to specimens):— Kemi 54·8, Oulu 62·7, Kokemäki 60·7 and Kymi area 44·3%, i. e. either above or just below 50%. If we examine — from Table 20 — the share of the group under discussion in catches for the various years, we find the following: the group played the most important part in forming the catches (data considered only since 1925) as follows: Kemi area 1935: 68·5%; Oulu area 1927: 85·1% and 1932: 75·8%; Kokemäki River 1930: 78·3% and 1934: 80·3%; Kymi River 1927 and 1934: 61—68%. It has been at its lowest in the Kemi area 1925 (22·5%) and 1926 (28·2%), Oulu River 1926 (42·1%), Kokemäki River 1928 (43%), and Kymi River 1926 (16—17%). The above variations, often considerable, are naturally in the main attributable to the fluctuation phenomenon, although other reasons have possibly had some bearing on the matter.

This life-cycle group (A.3+) was exceptional during the years 1930—35 in the Tornio area, where its mean proportion did not rise higher than 29·1%. The maximum occurred there in 1934 (37·2%) and its minimum the year before that, 1933 (15·2%). In the Tornio area during the period in question this group has only been present as a fairly large complementary group in the catch.

The main complementary group in catches obtained

Table 12. **Division of Salmon into Life-Cycle Classes** according to specimen scales. **Tornio River.**

Age-Classes	Life-Cycle Class	Number							Percentage						
		1930	1931	1932	1933	1934	1935	1930—1935	1930	1931	1932	1933	1934	1935	1930—1935
3	2.1+	1	9	—	4	3	4	**21**	0·2	0·9	—	0·4	0·1	0·5	**0·3**
4	2.2+	—	2	4	—	8	2	**16**	—	0·2	0·8	—	0·3	0·2	**0·2**
	3.1+	55	65	163	236	149	328	**996**	11·4	6·3	32·7	22·4	6·7	37·0	**16·1**
	4.+	—	—	—	—	4	—	**4**	—	—	—	—	0·2	—	**0·1**
5	2.3	3	4	3	14	10	15	**49**	0·6	0·4	0·6	1·3	0·4	1·7	**0·8**
	3.2+	80	331	61	337	570	151	**1530**	16·6	32·0	12·3	31·9	25·5	17·0	**24·7**
	4.1+	41	35	26	188	159	46	**495**	8·5	3·4	5·2	17·8	7·1	5·2	**8·0**
	5.+	—	—	—	—	5	—	**5**	—	—	—	—	0·2	—	**0·1**
6	2.4	1	—	—	2	3	1	**7**	0·2	—	—	0·2	0·1	0·1	**0·1**
	3.3	131	207	78	87	750	186	**1439**	27·1	20·0	15·7	8·2	33·5	21·0	**23·2**
	4.2+	59	250	56	68	346	49	**828**	12·3	24·2	11·2	6·4	15·5	5·5	**13·4**
	5.1+	6	—	1	8	49	2	**66**	1·2	—	0·2	0·8	2·2	0·2	**1·1**
7	2.5	—	—	—	—	—	1	**1**	—	—	—	—	—	0·1	**0·02**
	3.4	44	40	18	20	16	9	**147**	9·1	3·9	3·6	1·9	0·7	1·0	**2·4**
	4.3	24	31	60	57	73	67	**312**	5·0	3·0	12·1	5·4	3·3	7·6	**5·0**
	5.2+	3	3	—	—	15	2	**23**	0·6	0·3	—	—	0·7	0·2	**0·4**
8	3.5	4	8	2	1	4	1	**20**	0·8	0·8	0·4	0·1	0·2	0·1	**0·3**
	4.4	11	7	5	7	7	1	**38**	2·3	0·7	1·0	0·7	0·3	0·1	**0·6**
	5·3	—	1	—	2	—	—	**3**	—	0·1	—	0·2	—	—	**0·05**
9	4·5	—	1	—	—	—	—	**1**	—	0·1	—	—	—	—	**0·02**
	Total...	**463**	**994**	**477**	**1031**	**2171**	**865**	**6001**	**95·9**	**96·3**	**95·8**	**97·7**	**97·0**	**97·5**	**96·9**
Previously spawned:															
	once	19	34	20	23	61	21	**178**	3·9	3·3	4·0	2·2	2·8	2·4	**2·9**
	twice	1	4	1	—	3	1	**10**	0·2	0·4	0·2	—	0·1	0·1	**0·2**
	three times	—	—	—	1	2	—	**3**	—	—	—	0·1	0·1	—	**0·05**
	Total...	**20**	**38**	**21**	**24**	**66**	**22**	**191**	**4·1**	**3·7**	**4·2**	**2·3**	**3·0**	**2·5**	**3·1**
	Specimens...	**483**	**1032**	**498**	**1055**	**2237**	**887**	**6192**							

in Finnish salmon waters is nevertheless the life-cycle group: A.2+, the salmon of which on spending two years at sea return to the rivers during the third summer. This group is also that which formed the majority, as regards numbers, of the 1930—35 catch in the Tornio area. Nevertheless the group has not formed an absolute majority even in the Tornio area except in 1931 when the percentage was 56·7. In other years it has fluctuated, being, for example, 23% in 1935 and 42% in 1934. In the Kemi area this group achieved an absolute majority in 1933, 53%; the minimum there being in 1929, 6·8%, and the mean percentage amounting to 26·2. The proportion of this group is even smaller in the Oulu River, averaging 12·9%. The maximum (since 1925) was in 1931: 23·2%, and the minimum in 1927 and 1929: 4·3 and 4·1%. The group reached its maximum in the Kokemäki River in 1935: 16·3% (the catch in 1931 was too small to be taken into consideration), while the mean there has been only 6·7%. The figures for the Kymi River show the following:— an almost absolute majority occurred at the Langinkoski Rapids in 1920: 50% (Ahvenkoski only 38·7% during the same year) and in 1926: 54%; Ränninkoski Rapids in 1926: 65·5%, combined 62·4%; Ränninkoski Rapids in 1931: 53·9%, Langinkoski Rapids during the same year only 43·6% (combined 50·1%); Langinkoski Rapids in 1932: 55·5%, Ränninkoski Rapids during the same year: 58·4% (combined 56·5%). This group has also been least important in 1923 at the Langinkoski Rapids: 2·8%, Ahvenkoski Rapids: 5·1%; in 1924 at the Langinkoski Rapids: 6·3%, and in 1930 at the Langinkoski Rapids: 5·9%, whereas at the Ränninkoski Rapids: 15·9%.

Another, although less important, complementary group is formed by the classes that have spent four full years on their first migration, and thus arrived at the spawning rivers only during their fifth migratory summer. The mean proportion of this life-cycle group in catches of salmon varies (according to specimens) between 16 and 3%. As this group is only a relatively small proportion of salmon arriving at the Tornio

Appendix to Table 12.

Previously spawned Salmon divided into Life-Cycle Classes. **Tornio River.**

Age	Description	Specimens taken per year						Total
		1930	1931	1932	1933	1934	1935	1930—1935
Once spawned								
5 years	2.1+G1.....	—	—	1	—	—	—	1
	3.1+G1.....	—	—	1	3	4	—	8
6 years	3.1+G1.....	—	—	3	1	16	1	22
	3.2+G1.....	—	—	—	—	2	—	2
	4.1+G1.....	—	1	—	—	1	1	3
7 years	2.3G1.....	1	—	—	1	1	1	5
	3.1+G2.....	1	1	—	—	—	1	3
	3.2+G1.....	3	—	1	—	—	1	5
	3.3G1.....	—	—	—	—	1	—	1
	4.1+G1.....	1	1	—	1	—	1	4
	4.2G1.....	1	—	—	—	1	—	2
8 years	3.3G1.....	8	11	5	8	16	8	56
	4.1+G2.....	—	—	—	1	—	—	1
	4.2+G1.....	2	1	2	—	3	1	9
	4.3G1.....	—	—	—	1	—	—	1
9 years	3.4G1.....	1	2	2	—	—	—	5
	4.3G1.....	2	10	5	—	8	1	26
10 years	4.4G1.....	—	3	—	—	1	—	4
	Total...	19	34	20	23	61	21	178
	Percentage...	3·9	3·3	4·0	2·2	2·8	2·4	2·9
Twice spawned								
9 years	3.2+G1G1	1	—	1	—	—	—	2
10 years	3.3G1G1	—	4	—	—	3	—	7
11 years	4.3G1G1	—	—	—	—	—	1	1
	Total...	1	4	1	—	3	1	10
	Percentage...	0·2	0·4	0·2	—	0·1	0·1	0·2
Three Times spawned								
10 years	3.2G1G1G1	—	—	—	1	—	—	1
13 years	4.4G1G1G1	—	—	—	—	2	—	2
	Total...	—	—	—	1	2	—	3
	Percentage...	—	—	—	0·1	0·1	—	0·05

River, it can perhaps be presumed that this is caused by the fact that owing to the length of their smolt age these fish have a shorter migratory period.

The fluctuations in this life-cycle group in the various rivers were as follows. Maximum quantities in the Kemi River in 1925 and 1928—30: 15·2 to 21·6 %; in the Oulu River during the same years: 23 to 31·8 %; in the Kokemaki River in 1928, 1931 and 1932: 31·0 to 32·1 %; in the Kymi River in 1930: 22·3 %. Minimum quantities in the Kemi River in 1927, 1934 and 1935: 1·8 to 3·1 %; in the Oulu River 1927 and 1932—34: 6·8 to 9·3 %; in the Kokemäki River in 1932 and 1934: 1·8 to 7·4 %; in the Kymi River in 1932: 1·1 %.

The life-cycle classes distinguished by the extreme length of their first migration — five, or even six, full years — are so few in number that they are of no importance in forming the catch, despite the fact that the fish themselves are naturally of large size and heavy weight. My collection contains 156 specimens of salmon that have migrated for five years before their first spawning from the Bothnian Bay salmon area. Of these 22 are from the Tornio River, 75 from the Kemi area and 79 from the Oulu River. This represents about 6·3 individuals per thousand — I have 16 specimens from the southern Finnish rivers — the Kokemäki and the Kymi Rivers — this corresponds to 2·1 individuals per thousand. There are only two salmon, caught in the Oulu River, which have remained in the sea as much as six years before ascending for the first time. Considering the large quantity of salmon samples collected from the Bothnian Bay they represent about one specimen per ten thousand individuals only.

It is also of interest to examine the final results in respect of the proportion of the various life-cycle class-groups in the catch, when all specimens, both from the Bothnian Bay salmon area and the southern Finnish rivers (Kokemäki and Kymi) are combined. *The result is that half the catch, i. e., 50·8 %, in the*

Table 13. **Division of Salmon into Life-Cy**

Number

Age-Classes	Life-Cycle Class	1915[1]	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
3	2.1+	—	—	—	—	6	—	1	—	—	3	4	1
	3.+	—	—	—	—	—	—	—	—	—	—	—	
4	1.3	1	—	—	—	—		—	—	—	—	—	—
	2.2+	13	3	1	—	12	6	4	4	2	6	4	48
	3.1+	(14)[2]	2	—	—	37	24	8	9	3	73	5	37
	4.+	—	—	—	—	—	—	—	—	—	—	—	—
5	2.3	1	5	16	2	9	5	6	6	19	15	1	24
	3.2+	13	11	11	2	76	84	53	50	34	90	58	121
	4.1+	(1)[2]	—	—	—	4	2	—	—	—	22	—	7
	5.+	—	—	—	—	—	—	—	—	—	—	—	—
6	2.4	—	1	—	16	—	3	—	3	6	10	2	2
	3.3	26	79	13	30	77	55	81	178	307	170	81	398
	4.2+	—	3	1	—	5	8	6	2	4	14	12	47
	5.1+	—	1	—	—	—	—	—	—	—	—	—	—
7	2.5	—	—	—	—	4	—	—	—	—	—	—	—
	3.4	3	8	12	13	90	11	3	45	108	105	16	35
	4.3	1	29	4	—	9	2	2	2	44	17	7	167
	5.2+	—	—	—	—	—	—	—	—	—	—	—	2
8	3.5	—	—	—	1	21	1	—	10	10	13	1	4
	4.4	1	3	—	2	2	1	—	1	8	13	2	11
	5.3	—	—	—	—	—	—	—	—	—	—	—	2
9	4.5	—	—	1	—	1	—	—	—	—	—	—	—
	5.4	—	—	—	—	—	—	—	—	—	—	1	—
	Total...	**59 (15)**	**145**	**59**	**66**	**353**	**202**	**164**	**310**	**545**	**551**	**194**	**906**
Previously spawned:													
	once	2	7	11	9	62	14	3	11	39	41	14	72
	twice	1	—	—	—	8	4	4	1	3	2	1	10
	three times	—	—	—	—	1	—	—	—	—	—	1	—
	four times	—	—	—	—	—	—	—	—	—	—	—	1
	Total...	**3**	**7**	**11**	**9**	**71**	**18**	**7**	**12**	**42**	**43**	**16**	**83**
	Specimens...	**62 (15)**	**152**	**70**	**75**	**424**	**220**	**171**	**322**	**587**	**594**	**210**	**989**

[1]) Collected June—July.
[2]) Selected individual salmon subsequent to 28th July.

Bothnian Bay area, is composed of the life-cycle group that has spent three migratory years at sea (A.3+), and that one quarter, i.e., 24·9%, of the group that has spent two years on migration (A.2+). These two groups combined thus represent three quarters of the catch (by number). The result for the southern Finnish rivers is more or less the same, the figures corresponding to those given above being 47·7 and 25·7%, a total of 73·4%.

The life-cycle groups whose migratory period at sea has been of long duration — three or more years, — are those which arrive first in the spring at the mouths of the rivers preliminary to ascending. Groups which have spent two years on migration generally arrive slightly later.

The figures which I have given above form the basis for the important fact that *the shoals of salmon returning for the first time from their migration together form the absolutely predominant portion of the catch*; the various years under survey combined give the following figures:— Tornio River: 96·9%, Kemi area: 93·7%, Oulu River: 95·5%, and Kymi River: 90·4%. The Kokemäki River value diverges from the others — 84·2% — but I will revert to this question later.

In the following I will deal with results obtained with regard to the length of the first migratory period. These results have been obtained by investigating Baltic salmon at other places. Rosén's and Alm's results are as follows:

(See foot on p. 43 and p. 45.)

sses according to specimen scales. **Kemi River.**

		Percentage														
1	**20**	—	—	—	—	1·4	—	0·6	—	—	0·5	1·9	0·1	—	0·2	0·05	**0·2**
	1																**0·01**
	1																**0·01**
15	**167**																**1·8**
14	**339**																**3·5**
	1																**0·01**
142	**514**																**5·3**
292	**1918**	21·0	7·2	15·7	2·7	18·0	38·2	31·0	15·5	5·8	15·2	27·6	12·2	45·8	12·6	17·2	**19·9**
2	**87**																**0·9**
	9																**0·1**
5	**70**																**0·7**
861	**4138**	42·0	52·0	18·6	40·0	18·3	25·0	47·4	55·4	52·3	28·6	38·5	40·3	19·4	60·5	49·0	**43·0**
78	**421**	—	2·0	1·4	—	1·2	3·6	3·5	0·6	0·7	2·4	5·7	4·8	4·9	6·6	4·6	**4·4**
1	**12**	—	0·7	—	—	—	—	—	—	—	—	—	—	0·1	0·4	0·05	**0·1**
1	**7**																**0·1**
46	**568**	4·8	5·3	17·2	17·3	21·2	5·0	1·8	14·0	18·4	17·6	7·6	3·5	2·1	1·6	2·7	**5·9**
187	**610**	1·6	19·1	5·7	—	2·1	0·9	1·2	0·6	7·5	2·9	3·3	16·9	4·0	3·1	11·0	**6·3**
3	**9**																**0·1**
	66																**0·7**
3	**60**																**0·6**
1	**3**																**0·03**
	2																**0·02**
	1																**0·01**
1620	**9024**	**95·2**	**95·4**	**84·3**	**88·0**	**83·3**	**91·8**	**95·9**	**96·3**	**92·8**	**92·8**	**92·4**	**91·6**	**94·8**	**94·8**	**95·6**	**93·7**
69	**545**	3·2	4·6	15·7	12·0	14·6	6·4	1·8	3·4	6·7	6·9	6·6	7·3	4·7	4·8	4·1	**5·7**
5	**56**	1·6	—	—	—	1·9	1·8	2·3	0·3	0·5	0·3	0·5	1·0	0·5	0·4	0·3	**0·6**
1	**4**	—	—	—	—	0·2	—	—	—	—	—	0·5	—	—	0·03	0·05	**0·04**
	1																**0·01**
75	**606**	**4·8**	**4·6**	**15·7**	**12·0**	**16·7**	**8·2**	**4·1**	**3·7**	**7·2**	**7·2**	**7·6**	**8·4**	**5·2**	**5·2**	**4·4**	**6·3**
1695	**9630**																

Rosén's Results (1918):

	Number					Percentage			
	A.1+	A.2+	A.3+	A.4+	Total	A.1+	A.2+	A.3+	A.4+
Torne (1916)	—	9	11	1	21	—	42·9	**52·4**	4·7
Kalix (1915, 1916)	5	16	8	1	**30**	16·6	**53·3**	26·6	3·3
Lule (1915)	21	63	71	22	**177**	11·9	35·6	**40·1**	12·4
Pite (1915)	2	17	34	5	**58**	3·4	29·3	**58·6**	8·6
Total...	28	105	124	29	**286**	9·8	36·7	**43·3**	10·1
Ume (1916—1917)	3	29	114	1	**147**	2·0	19·7	**77·5**	0·7
Combined...	31	134	238	30	**433**	7·2	30·9	**55·0**	6·9

A comparison of Alm's percentage figures given on p. 45 with the proportion of the various life-cycle groups yielded by Finnish specimens shows that the figures for the Kalix and Lule Rivers are connected

Appendix to Table 13.

Kemi River.

Age	Description	Specimens taken per year															Total
		1915	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1915; 1922—1935
	Once spawned																
5 years	2.1+G1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	2
	3.1+G+	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	3
6 years	2.1+G2	—	—	—	1	—	—	—	—	1	2	—	—	1	1	—	6
	2.2+G1	—	—	—	—	1	—	—	—	—	—	—	—	2	2	—	5
	2.3G+	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
	3.1+G1	—	—	—	—	1	—	—	1	—	—	1	1	2	12	6	24
	3.2+G+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
7 years	2.1+G3	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
	2.3G1	1	—	1	—	8	—	—	—	1	2	—	1	3	2	3	22
	3.1+G2	—	—	—	—	—	—	—	2	2	—	—	—	2	4	10	20
	3.2+G1	—	2	—	—	5	—	2	—	4	3	1	6	8	13	16	60
	3.3G+	—	—	—	—	—	—	—	—	—	—	—	7	2	8	3	20
	4.1+G1	—	—	—	—	—	—	—	—	—	—	—	1	1	1	1	4
	4.2+G+	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	3
8 years	2.3G2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
	2.4G1	—	—	—	1	1	1	—	—	—	—	—	—	—	3	—	6
	3.1+G3	—	—	—	—	1	—	—	—	2	1	—	—	—	—	—	4
	3.2+G2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3	4
	3.3+G1	—	2	8	7	34	13	1	5	23	25	7	28	21	51	20	245
	3.4G+	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	2
	4.1+G2	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	2
	4.2+G1	—	—	—	—	—	—	—	—	—	2	—	2	3	2	2	11
	4.3G+	—	—	—	—	—	—	—	—	—	—	—	11	—	—	—	11
9 years	3.4G1	—	—	—	—	8	—	—	1	4	5	4	3	1	3	1	30
	4.1+G3	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
	4.3G1	—	2	1	—	2	—	—	—	—	1	1	8	1	9	1	26
	4.4G+	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	2
	5.2+G1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
10 years	4.4G1	—	1	—	—	—	—	—	—	—	—	—	—	2	—	—	3
	Total...	1	7	10	9	62	14	3	11	39	41	14	69	56	116	69	521[1])
	Percentage...	1·6	4·6	14·3	12·0	14·6	6·4	1·8	3·4	6·7	6·9	6·6	7·0	3·6	4·6	4·0	5·4
	Twice spawned																
7 years	2.2+G1G+	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
8 years	2.2+G1G1	1	—	—	—	—	—	—	—	—	1	—	—	—	—	1	3
9 years	2.3G1G1	—	—	—	—	—	—	3	—	—	—	—	—	1	2	—	6
	3.1+G2G1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
	3.2+G1G1	—	—	—	—	—	—	—	1	—	—	—	—	—	1	1	3
10 years	3.3G1G1	—	—	—	—	8	1	—	—	2	1	1	6	4	5	3	31
	4.2+G1G1	—	—	—	—	—	—	—	—	1	—	—	2	—	—	—	3
11 years	3.4G1G1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
	4.3G1G1	—	—	—	—	—	3	—	—	—	—	—	—	2	—	—	5
	Total...	1	—	—	—	8	4	4	1	3	2	1	9	7	9	5	54[1])(0·7%)
	Three Times spawned																
11 years	3.1+G2G1G1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
12 years	3.3G1G1G1	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	3
	Total...	—	—	—	—	1	—	—	—	—	—	1	—	—	1	1	4(0·04%)
	Four Times spawned[2])																
10 years	4.1+G+G+G+G1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1(0·01%)

[1]) Descending specimens (kelts) not included: once spawned, 24 specimens; twice spawned, 2 specimens; see App. (B) to Tables 13, 14 and 16, p. 57.
[2]) Unique individual of its type, obtained from Valkeakari, June 9th, 1932. See JÄRVI and MENZIES, 1936, p. 40—41 (Fig. 48—50). Age open to investigation.

Alm's results (1934):

	Number						Percentage				
	A.1+	A.2+	A.3+	A.4+	A.5+	Total	A.1+	A.2+	A.3+	A.4+	A.5+
Kalix (1928—31)	28	74	76	21	—	199	14·1	37·2	38·1	10·6	—
Luleå (1928—31)	55	32	57	17	—	161	34·2	19·9	35·4	10·6	—
Combined...	83	106	133	38	—	360	23·1	29·4	36·9	10·6	–
Ume (1930—31)	5	47	83	14	—	149	3·4	31·5	55·7	9·4	—
Angermanälven (1925—28, 1931—32)	11	161	220	42	2	436	2·5	36·9	50·5	9·6	0·5
Indal (1927—29, 1931—32)	4	145	184	16	1	350	1·1	41·4	52·6	4·6	0·3
Ljung (1925—27)	—	16	36	2	—	54	—	29·6	66·7	3·7	—
Combined...	20	369	523	74	3	989	2·0	37·3	52·9	7·5	0·3
Ljusne (1926—27, 1930—32)	8	83	259	34	1	385	2·1	21·6	67·3	8·8	0·3
Dal (1926—27)	1	39	145	28	—	213	0·5	18·3	68·1	13·1	–
Combined...	9	122	404	62	1	598	1·5	20·4	67·5	10·4	0·2
Total...	112	597	1060	174	4	1947	5·8	30·7	54·4	8·9	0·2
Mörrum (1916)	4	12	62	3	—	81	4·5	14·8	76·0	3·7	—
Mörrum (1926—29, 1931—32)	29	110	307	9	—	455	6·4	24·2	67·4	2·0	—
Combined...	33	122	369	12	—	536	6·2	22·8	68·8	2·2	—

with the figures for the Torne River in so far as salmon which had spent three years on migration did not form an absolute majority — i. e., they did not amount to half, or more than half of the total quantity of salmon investigated, but those salmon groups which had spent a shorter migratory period (either A.2+ or A.1+) had a corresponding individual number. On the other hand the figures for the other rivers show the same absolute majority — 50·5% — 76·0% — of salmon which had spent three years on migration, as is apparent from the Kemi, Oulu and Kokemäki rivers on the Finnish side. All observations made in Sweden if combined — in as much as they deal with salmon which have ascended rivers entering the Gulf of Bothnia — give a similar general view of the life-cycle groups determining the size of the catch. From this it appears that about half, i. e., 54·4%, of all salmon ascending the rivers belong to life-cycle classes which previously to ascending the rivers have spent three years on migration, and that the following group, 30·7%, consists of salmon that have spent two years — excluding the ascending year — on migration.

The following figures are available as regards the length of the migratory period of salmon obtained from the southern parts of the Baltic (Dixon):

Dixon: a. Salmon caught with drift nets

	Number of Fish ex-amined	Percentage			
		A.2+	A.3+	A.4+	A.5+
1928	100	33·0	65·0	2·0	—
1931	176	70·0	22·0	7·0	1·0
1932	90	73·0	25·0	1·0	—
1933	98	53·0	10·0	35·0	3·0
Total	464	57·0	38·0	3·0	2·0

b. Salmon caught with hooks

1928	30	17·0	63·0	20·0	—
1933	67	32·0	57·0	11·0	—
Total	97	25·0	60·0	15·0	—

The figures respecting salmon caught in East Prussia given by Willer and Quednau (1934, Tab. 10 a.) are as follows: (The compilers apparently have not differentiated between salmon which have already ascended the rivers and those that have returned to the sea, as their table included 12 salmon which had spent six years, one seven years and one ten years in the sea; I have deleted the last two from the following table, on Duration in Sea):—

Duration in Sea.

	Number							Percentage					
Group	A.1	A.2	A.3	A.4	A.5	A.6	Salmon investig.	A.1	A.2	A.3	A.4	A.5	A.6
1928/29	—	5	18	42	20	9	96	—	5·2	18·8	43·8	20·8	9·4
1929/30	—	46	194	81	25	2	348	—	13·2	55·7	23·3	7·2	0·6
1930/31	11	852	203	90	26	1	683	1·6	51·5	29·7	13·2	3·8	0·2
Total...	11	403	415	213	71	12	1127	1·0	35·8	36·9	18·9	6·3	1·4

Table 14. **Division of Salmon into Life-Cy**

Number

Age-Classes	Life-Cycle Class	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
3	2.1+	1	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	28	31
	3.+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
4	2.2+	5	—	2	—	2	1	—	—	9	4	3	6	2	8	5	23	13	35
	3.1+	9	8	1	16	3	—	—	—	1	1	—	8	—	2	—	—	96	115
	4.+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
5	2.3	19	7	6	3	3	—	11	2	13	35	32	14	15	60	16	46	153	101
	3.2+	14	3	27	6	20	3	2	—	24	58	22	30	11	53	87	77	105	63
	4.1+	2	1	—	2	1	—	—	—	—	—	—	1	—	—	—	—	12	19
6	2.4	4	1	3	1	1	—	6	9	5	15	12	9	3	16	19	6	13	16
	3.3	216	20	20	16	17	15	28	22	106	70	524	200	181	165	227	536	337	747
	4.2+	1	—	12	—	6	—	—	—	2	2	4	4	—	3	20	16	15	9
	5.1+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	1
7	2.5	—	—	—	—	—	—	—	—	—	1	1	—	—	1	1	—	1	5
	3.4	15	13	9	2	4	3	36	24	54	33	34	86	64	126	67	51	62	97
	4.3	8	3	1	4	9	2	11	2	4	4	22	18	18	13	5	117	106	62
	5.2+	—	—	—	—	1	—		—	—	—	—	—	—	—	—	—	—	—
8	3.5	—	—	2	—	—	—	—	2	13	3	1	2	2	7	3	3	11	4
	4.4	3	—	3	—	1	—	6	6	2	3	—	4	7	8	7	11	19	14
	5.3	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	—
9	3.6	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—
	4.5	—	—	—	—	—	—	—	—	2	1	—	—	—	1	—	1	—	1
10	5.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Total...	**297**	**56**	**86**	**52**	**68**	**24**	**100**	**67**	**235**	**232**	**655**	**382**	**304**	**463**	**457**	**888**	**977**	**1323**
Previously spawned:																			
	once	11	10	6	—	1	—	10	6	18	16	18	12	13	8	21	34	34	41
	twice	—	—	—	—	—	1	—	—	4	10	6	—	—	—	4	2	3	4
	three times	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
	Total...	**11**	**10**	**6**	**—**	**1**	**1**	**10**	**6**	**22**	**27**	**24**	**12**	**13**	**8**	**25**	**36**	**37**	**46**
	Specimens...	**308**	**66**	**92**	**52**	**69**	**25**	**110**	**73**	**257**	**259**	**679**	**394**	**317**	**471**	**482**	**924**	**1014**	**1369**

Both Dixon's and Willer and Quednau's figures show one fact which was to be expected — that the share in the specimens (catches) of salmon which had spent two years on migration rises in comparison with fish which had spent three years on migration. The Willer and Quednau observations also show that during the period 1928—31 the life-cycle groups are moving from older to younger age-groups; this observation is based on the fluctuation phenomenon which influences the stock of salmon.

C. Previously Spawned Salmon.

Owing to the tremendous predominance in the catch of salmon ascending for the first time, of which mention was made in the previous chapter, the proportion of previously spawned salmon is inconsiderable. This will be seen from the following survey:

(The survey is given on p. 47.)

The said survey shows that the comparative number of previously spawned salmon in my specimens from the Bothnian Bay area is half of those among the specimens from the rivers of southern Finland. The number of previously spawned salmon in the combined collections from the Tornio, Kemi and Oulu Rivers amount to less than 5% (4·9) whereas the number of these fish in the specimens from the south of Finland represent 10·9%, the percentage in the Kymi River specimens being 9·6 and Kokemäki River 15·8. I will deal with this peculiarity of the southern Finnish rivers and particularly of the Kokemäki River later in this paper.

ses according to specimen scales. Oulu River.

Percentage

1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1917–1935
0·3																	2·3	0·4	0·8
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0·01
1·6	—	2·2	—	2·9	4·0	—	—	3·5	1·5	0·4	1·5	0·6	1·7	1·0	2·4	1·3	2·5	3·8	2·0
2·9	12·1	1·1	30·8	4·3	—	—	—	0·4	0·4	—	2·0		0·4	—			8·4	1·9	3·5
																	0·2	—	0·03
6·2	10·6	6·5	5·8	4·3	—	10·0	2·7	5·1	13·5	4·7	3·6	4·7	12·7	3·3	5·9	15·1	7·4	15·9	8·8
4·5	4·5	29·3	11·6	29·0	12·0	1·8	—	9·3	22·4	3·2	7·6	5·6	11·3	18·1	8·5	10·8	4·6	14·8	9·5
0·7	1·5		2·8	1·5							0·8					1·2	1·4	0·3	0·5
1·3	1·5	3·3	1·9	1·5	—	5·5	12·4	1·9	5·8	1·8	2·3	1·6	3·4	3·9	0·4	1·5	1·2	1·5	1·9
79·1	80·4	21·7	30·8	24·6	60·0	25·5	30·2	41·1	27·0	77·2	50·8	87·1	35·0	47·1	38·0	37·7	54·6	40·8	48·3
0·3		13·0		8·7				0·8	0·8	0·6	1·0		0·6	4·2	1·1	1·5	0·6	1·4	1·4
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0·3	0·1	—	0·04
									0·4	0·1	—		0·2	0·2		0·1	0·3	—	0·1
4·9	19·7	9·8	3·8	5·7	12·0	32·7	32·9	21·0	12·7	5·0	21·8	7·2	26·8	13·9	5·5	6·1	7·1	8·6	10·9
2·6	4·5	1·1	7·7	13·0	8·0	10·0	2·7	1·6	1·5	3·2	4·6	3·7	2·8	1·0	12·7	10·4	4·5	3·1	5·5
				1·5	—												—	0·1	0·02
		5·2					2·7	3·1	1·2	0·1	0·5	0·6	1·5	0·6	3·8	1·1	0·3	0·8	0·8
1·0		3·3		4·5		5·5	8·2	3·8	1·2	—	1·0	2·2	1·7	1·5	3·2	3·0	1·0	0·3	1·2
												0·3			0·1	0·1	—	0·2	0·1
									0·3				—	—		0·1	—	—	0·02
								0·3	0·3				0·2	—	0·1		0·1	—	0·1
																	—	0·1	0·01
96·4	84·8	93·5	100·0	98·5	96·0	91·0	91·8	91·4	89·6	96·4	97·0	95·9	98·3	94·8	96·1	96·4	96·6	94·0	95·5
3·6	15·2	6·5		1·5		9·1	8·2	8·6	10·4	3·6	3·0	4·1	1·7	5·2	3·9	3·6	3·4	6·0	4·5
					4·0			1·6	3·8	0·9	—		—	0·8	0·1	0·4	0·3	0·3	0·5
									0·4	—	—						0·1	—	0·02
3·6	15·2	6·5	—	1·5	4·0	9·1	8·2	8·6	10·4	3·6	3·0	4·1	1·7	5·2	3·9	3·6	3·4	6·0	4·5

Previously Spawned Salmon.

Number	Tornio 1930—1935	Kemi 1915, 1922–1935	Oulu 1917—1935	Total	Kuusinaki 1929—1935	Kymi 1920—1935	Total
Once spawned	178	545	321	1,044	222	477	699
Twice spawned	10	56	37	103	26	87	113
Three Times spawned	3	4	2	9	5	7	12
Total...	191	606[1])	360	1,157[1])	253	571	824
Grand Total of Salmon investigated	6192	9615	8045	23,852	1605	5960	7,565
Percentage							
Once spawned	2·9	5·7	4·0	4·4	13·9	8·0	9·2
Twice spawned	0·2	0·6	0·5	0·4	1·6	1·5	1·5
Three Times spawned	0·01	0·05	0·02	0·04	0·3	0·1	0·2
Total...	3·1	6·3	4·5	4·9	15·8	9·6	10·9

[1]) One specimen has been caught on its fifth ascent.

Appendix to Table 14.

Oulu River.

Age	Description	Specimens taken per year																Total
		1917	1918	1919	1921	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1917—1919; 1921—1935
Once spawned																			
4 years	2.1+G+	-			—	—	—	—		—	—	—	—	—	—	1	1	—	2
5 years	2.1+G1	-				—	—		1	—	1	—	—	—	—	2	—	1	5
	3.1+G+					—				—		-	—	—	—	3	3	—	6
6 years	2.1+G2					—				—		—		-	-	1	3	—	4
	2.2+G1					—		—		—		-		-	1	—	—	—	1
	3.1+G1					-	-			1	1	1	—	—	8	3	9	7	30
	3.2+G+				-	—				—	—	—	—		—	—	—	1	1
7 years	2.2+G2			1	-	-				—	—	—		—	—	1	—	—	2
	2.3G1	1	2	2		-		2	1	1	1	—	—	3	4	1	4	6	28
	2.4G+					—	—			—	—	—	—	-	-	1	—	—	1
	3.1+G2	—	—	—		3		2	—	1	5	—	—	1	—	3	1	2	18
	3.2+G1	6	2	—		1	-	1	—	5	—	1	1	—	5	4	2	3	31
	3.3G+	-	-							—	—	—	—		—	—	—	1	1
	4.1+G1	—	—		-	-	—			2	—	—	—	—	2	1	—	3	8
	4.1+G2	-		—		—				—			—	—	-	2	—	1	3
8 years	2.4G1	—	-		—	—	—	-	1	—	—	—	—	—	—	—	—	1	2
	3.1+G3	—	—		-	—	—	—	—		1	-	1	-		—	—	—	2
	3.2+G2	1	2		—	1	1	-	-	-	-	-	-	-	-	—	—	—	5
	3.3G1	3	4	3	-	2	2	10	7	5	3	10	4	12	7	8	14	27	121
	3.4G+	—		-	—	—	—	-	—		-		—	-	1	—	—	—	1
	4.2G1				—	—	—	—	—	-	-	1	—	—	—	—	—	1	2
	4.3G+	-	—	-	—	—	—	—	—		—	—	—	—	1	—	—	—	1
9 years	3.3G2	—		—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
	3.4G1	—	-	—	1	2	2	2	6	3	—	—	1	3	4	3	2	3	32
	4.3G1	—		—	—	1	1	—	—	—	—	—	1	—	—	—	2	4	9
	3.5G1	—	—	—	—	—	—	—	—	—	—	-	—	—	1	—	—	—	1
10 years	4.4G1		—	—	—	—	—		—	—	—	—	—	1	—	—	—	—	1
11 years	4.5G1	—	—			—	—		—	—	—	—	—	1	—	—	—	—	1
	Total...	11	10	6	1	10	6	18	16	18	12	13	8	21	34	34	41	61[1])	320[1])
	Percentages...	3·6	15·2	6·5	1·5	9·0	8·2	7·0	6·2	2·7	3·0	4·1	1·7	4·4	3·7	3·3	3·0	5·6	4·0
Twice spawned						1922													
7 years	2.1+G1G1...	—	—	—		—	—		-	—	-	—	—	—	—	—	1	—	1
8 years	2.2+G1G1...	—		—	—		—	1	—	—	—	—	—	—	-	—	—	—	1
9 years	2.3G1G1.....					—	—	—	1	2	—	—	—	—	—	—	1	—	4
	3.1+G2G1...			-	—	—	—	—	—	—	—		-	—	—	1	—	—	1
10 years	3.3G1G1.....			—	—	1	-	3	8	4	—	—	—	3	1	2	2	3	27
11 years	3.4G1G1.....		—	—	—	—	—			-	-	-	-	—	1	—	—	—	1
	4.3G1G1.....		—	—					1	—	—	—	—	1	—	—	—	—	2
	Total...			—	—	1	—	4	10	6	—	—	—	4	2	3	4	3	37 (0·5%)
Three times spawned																			
11 years	2.3G1G1G1 ..	—	—	—	—	—			1	—	—	—	—	—	—	—	—	—	1
12 years	3.3G1G1G1 ..	—	-		-	—		—	—	—	—	—	—	—	-	—	1	—	1
	Total...	—		—	—				1	—	—	—	—	—	—	—	1	—	2 (0·2%)

[1]) One descending specimen (kelt) not included, see p. 57.

It is natural that the major portion of previously spawned salmon is composed of individuals that are attempting to ascend their spawning rivers for the second time; their percentage of all salmon investigated from the Bothnian Bay area was 4·4. Fish on their third ascent represented less than 0·4% here, equal to 4 individuals per thousand fish; and salmon on their fourth ascent only 0·04%, or four individuals per ten thousand salmon. My entire collection contains one fish only that was caught on its fifth

Table 15. **Division of Salmon into Life-Cycle Classes according to specimen scales.** **Kokemäki River.**

Age	Life-Cycle Class	Number										Percentage									
		1925	1926	1927	1928	1929	1930	1931	1932	1934	1935	1925–1935	1926	1926	1927	1928	1929	1930	1931	1932	1934	1935	1925–1935
3	2.1+.	1	1	—	—	—	—	—	—	—	—	2	0·4	0·2	—	—	—	—	—	—	—	—	0·1
4	1.3.	—	1	—	—	—	—	—	—	—	—	1	—	0·2	—	—	—	—	—	—	—	—	0·1
	2.2+	8	17	3	3	5	—	5	6	9	20	76	3·4	4·1	1·5	3·0	5·3	—	17·8	7·2	5·6	11·6	4·7
	3.1+	—	1	—	—	—	—	1	—	—	—	2	—	0·2	—	—	—	—	3·6	—	—	—	0·1
5	2.3.	117	227	88	30	36	88	2	34	118	98	838	50·4	54·3	45·1	30·0	37·9	73·2	7·1	41·0	72·8	57·0	52·2
	3.2+	4	5	3	1	1	2	1	3	3	8	31	1·7	1·2	1·5	1·0	1·0	1·7	3·6	3·6	1·9	4·6	1·9
6	2.4.	50	65	22	23	11	11	7	2	11	18	220	21·6	15·6	11·3	23·0	11·6	9·2	25·0	2·4	6·8	10·5	13·7
	3.3.	31	14	12	13	12	6	1	19	12	14	134	13·4	3·3	6·1	13·0	12·7	5·0	3·6	22·9	7·4	8·1	8·4
7	2.5.	—	2	2	1	1	—	1	—	1	2	10	—	0·5	1·0	1·0	1·0	—	3·6	—	0·6	1·2	0·6
	3.4.	1	12	2	5	7	2	2	2	1	1	35	0·4	2·9	1·0	5·0	7·4	1·7	7·1	2·4	0·6	0·6	2·2
	4.3.	—	—	—	—	1	—	—	1	—	—	2	—	—	—	—	1·0	—	—	1·2	—	—	0·1
8	4.4.	—	—	—	1	—	—	—	—	—	—	1	—	—	—	1·0	—	—	—	—	—	—	0·1
	Total	212	345	132	77	74	109	20	67	155	161	1352	91·8	82·5	67·7	77·0	77·9	90·8	71·4	80·7	95·7	93·6	84·2
	Previously spawned:																						
once		19	64	62	14	17	9	7	14	5	11	222	8·3	15·3	31·8	14·0	17·9	7·5	25·0	16·9	3·1	6·4	13·9
twice		1	8	1	7	4	2	—	1	2	—	26	0·4	2·0	0·5	7·0	4·2	1·7	—	1·2	1·2	—	1·6
three times		—	1	—	2	—	—	1	1	—	—	5	—	0·2	—	2·0	—	—	3·6	1·2	—	—	0·3
	Total	20	73	63	23	21	11	8	16	7	11	253	8·7	17·5	32·3	23·0	22·1	9·2	28·6	19·3	4·3	6·4	15·8
	Specimens	232	418	195	100	95	120	28	83	162	172	1605											

Appendix to Table 15. **Kokemäki River.**

Age	Description	Specimens taken per year. 1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	Total
	Once spawned												
4 years	2.1+G+	—	1	—	—	—	—	—	—	—	—	—	1
6 years	2.1+G2	3		1								1	5
	2.2+G1	2	1	1			2	1			1	1	9
7 years	2.5G1	13	50	42	8	14	2	6	15		1	1	161
	3.2+G1	—	1			1							2
8 years	2.4G1	—	10	10	4	—	2	—	1	—	—	—	27
	3.3G1	1	1	6	2	2	3						15
9 years	3.4G1			2									2
	Total	19	64	62	14	17	9	7	14	—	5	11	222
	Percentage	8·3	15·3	31·8	14·0	17·9	7·5	25·0	16·9	—	3·1	6·4	13·8
	Twice spawned												
9 years	3.3G1G1	1	6	1	2	3	—	—	1	—	1	—	15
	3.2G1G1	—	—	—	1	—	—	—	—	—	—	—	1
10 years	3.4G1G1	—	—	—	—	—	2	—	—	—	—	—	2
	3.3G1G1	—	2	—	1	1	—	—	—	—	1	—	8
	Total	1	8	1	7	4	2	—	1	—	2	—	26 (1·6%)
	Three times spawned												
11 years	3.3G1G1G1	—	1	—	2	—	—	1	1	—	—	—	5
													5 (0·3%)

Table 16. **Division of Salmon into Life-C**

Number

Age-Classes	Life-Cycle Class	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933[1]
2	1.1+	1	—	—	—	—	—	1	—	—	—	—	1	—	—
3	1.2+	—	2	—	—	—	—	—	—		—	—	—	—	
	2.1+	18	47	—	—	2	1	72	15	10	11	7	58	30	—
4	1.3	—	—	3	—	—	—	—	1	5	—	—	—	—	—
	2.2+	61	40	26	3	8	29	228	110	65	38	7	121	189	3
	3.1+	7	—	—	—	—	—	9	3	3	2	1	9	2	—
5	1.4	—	—	—	1	—	—	—	—	—	1		—	—	—
	2.3	35	64	47	85	66	54	58	291	170	166	63	30	112	14
	3.2+	5	5	—	—	1	8	15	26	7	7	2	10	32	1
6	2.4	1	8	5	8	26	37	15	12	32	29	37	8	5	—
	3.3	4	13	4	4	4	14	13	10	26	7	19	10	7	3
7	2.5	—	—	—	—	—	—	—	—	1	1	—	2	—	—
	3.4	—	5	1	—	1	1	1	—	4	6	4	6	—	—
	4.3	—	—	—	—	—	—	—	—	—	—	—	—	2	—
8	3.5	—	—	—	—	—	—	1	—	—	—	—	—	—	—
	Total...	**132**	**184**	**86**	**101**	**108**	**144**	**413**	**468**	**323**	**268**	**140**	**255**	**379**	**21**
Previously spawned:															
	once	—	16	32	5	32	62	24	15	19	21	12	37	10	—
	twice	—	5	1	3	4	4	13	6	3	5	1	8	8	—
	three times	—	—	—	—	—	—	—	—	2	1	—	—	1	—
	Specimens...	—	**21**	**33**	**8**	**36**	**66**	**37**	**21**	**24**	**27**	**13**	**45**	**19**	—
	Total...	**132**	**205**	**119**	**109**	**144**	**210**	**450**	**489**	**347**	**295**	**153**	**300**	**398**	**21**
	Catch...	—	**269**	**832**	**839**	**454**	**324**	**450**	**490**	**347**	**295**	**153**	**302**	**398**	**23**

[1]) Few salmon were obtained from Langinkoski Rapids in 1933. This is *not, however,* due to a *bad* salmon year. On the contrary the summ did not rise to seines, as Koivukoski Rapids were then under construction. At the beginning of September the water was 1½ m. below the level of the

Appendix to Table 16.

Kymi River. Langinkoski Rapids.

Age	Description	Specimens taken per year 1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933[1]	1934	1935	Total 1921—1935
	Once spawned																
4 years	2.1+G+	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2
5 years	2.1+G1	4	—	—	2	—	3	4	—	—	—	2	3	—	—	—	18
	2.2+G+	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	2
6 years	2.1+G2	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3
	2.2+G1	—	13	—	12	3	1	3	7	8	2	1	—	—	4	—	54
	3.1+G1	2	—	—	3	—	—	—	—	—	—	—	—	—	—	—	5
7 years	2.2+G2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
	2.3G1	6	15	5	13	55	14	4	9	9	9	29	4	—	2	9	183
	3.2+G1	—	1	—	—	2	—	2	—	3	—	—	—	—	1	—	9
8 years	2.4G1	—	—	—	—	1	1	—	1	—	1	—	—	—	—	—	4
	3.3G1	2	3	—	1	1	2	2	1	—	—	5	3	—	—	1	21
9 years	3.4G1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
	Total...	16	32	5	32	62	24	15	19	21	12	37	10	—	7	11	303
	Percentages...	7·8	26·9	4·6	22·2	29·5	5·3	3·1	5·5	7·1	7·8	12·3	2·5	—	3·4	6·0	8·1

[1]) No scales collected.

ascent. This fish was obtained in the estuary of the Kemi River (Valkeakari waters) on June 9th 1932, and is a male, 124 cm. in length and 19·0 kg. in weight. A photograph of one of its scales is published on pp. 40—41, Fig. 48—50 of the guide compiled by W. M. Menzies and the author (1936). As mentioned in this guide (p. 8) the scales of this fish were exceptional in so far as the deformation usually present

es according to specimen scales. **Kymi River: Langinkoski.**

Percentage

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	0·8					—	0·2	—	—	—	—	0·3	—	—	—	—	0·1
2		1·0															0·1
289	13·6	25·0			1·4	0·5	16·0	3·1	2·9	3·7	4·6	19·3	7·5	—	3·4	6·0	7·7
9			2·5			—	—	0·2	1·4	—	—	—	—	—	—	—	0·2
967	46·2	19·5	21·9	2·8	5·6	13·8	50·7	22·5	18·7	12·9	4·6	40·4	47·5	14·3	10·2	9·8	25·7
41	5·3						2·0	0·6	0·9	0·7	0·7	3·0	0·5		1·5	1·1	1·1
2				0·9						0·3							0·1
1472	26·5	31·2	39·5	78·0	45·8	25·7	15·0	39·5	19·6	56·1	41·1	10·0	28·2	66·6	66·0	44·0	39·1
131	3·8	2·4	—	—	0·7	3·8	3·3	5·3	2·0	2·4	1·3	3·3	8·0	4·8	5·3	0·5	3·5
262	0·8	3·9	4·2	7·3	18·0	17·6	3·3	2·5	9·2	9·8	24·2	2·7	1·3	—	6·3	14·1	7·0
171	3·0	6·4	3·4	3·6	2·8	6·7	2·9	2·0	7·5	2·4	12·4	3·3	1·7	14·3	1·9	15·8	4·5
5									0·8	0·3		0·7			0·5		0·1
32	—	2·4	0·8	—	0·7	0·5	0·2	—	1·2	2·0	2·6	2·0	—	—	—	1·6	0·8
2													0·3				0·1
1							0·2										0·03
3389	100·0	80·8	72·3	92·6	75·0	68·6	91·8	95·7	93·1	90·9	91·5	85·0	95·2	100·0	95·1	92·9	90·1
303	—	7·8	26·9	4·6	22·2	29·5	5·3	3·1	5·5	7·1	7·8	12·3	2·5	—	3·4	6·0	8·1
64	—	2·4	0·8	2·8	2·8	1·9	2·9	1·2	0·9	1·7	0·7	2·7	2·0	—	1·0	0·6	1·7
6									0·3	0·3			0·3		0·1	0·5	0·1
373	—	10·2	27·7	7·4	25·0	31·4	8·2	4·3	6·9	9·1	8·5	15·0	4·8	—	4·9	7·1	9·9
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next summer in other parts of the Kymi River. During the summer in question the water was extremely low at Langinkoski Rapids and the salmon additional scale specimens in 1934 from sea.

Age	Description	Specimens taken per year															Total
		1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1921—1935
Twice spawned																	
7 years	2.1+G1G1..			--				—	-	—	—	1	—	—	—	—	1
8 years	2.1+G2G1..			1	—				-	—	—	—	—	—	—	—	1
	2.2+G1G1..			—	2	2	5										12
9 years	2.3G1G1.....	3	1	2	2	2	4	5	3	5	1	7	7	—	1	1	42
	3.2+G1G1...			—	—		1	—	—	—	—	—	—	—	—	—	1
10 years	2.4G1G1			—				—	—	1	—	—	1	—	1	—	3
	3.3G1G1. .	2		—				1	—	1	—	—	—	—	—	—	4
	Total..	5	1	3	4	1	13	6	3	5	1	8	8	—	2	1	64 (1·7%)
Three times spawned[1])																	
10 years	2.2G1G1G1 .							—	—	—	—	—	1	—	—	—	1
11 years	2.3G1G1G1 ..							—	1	1	—	—	—	—	1	1	4
	Total...							—	1	1	—	—	1	—	1	1	5 (0·1%)

[1]) One descending salmon (kelt) not included, see p. 57.

m scales of previously spawned salmon had not once spread to the inner edge of the scale, but only made its appearance on the outer edge. From this the conclusion — always, of course, uncertain to some extent — was drawn that this salmon had probably not made complete ascents, i. e., those lasting the whole winter, but only shorter trips. This fish had apparently happened to make these ascents in successive years. If we do not assume this the fish would have been of an absolutely exceptional age.

The relative quantity of previously spawned salmon also reflects the changes due to the phenomenon of

Table 17 A. **Division of Salmon into Life-Cycle Classes** according to specimen scales. **Kymi River: Ahvenkoski.**

Age-Classes	Life-Cycle Class	1920	1921	1922	1923	1920—1923	1920	1921	1922	1923	1920—1923
3	2.1+	2	34	1	—	**37**	1·9	27·6	0·9	—	**9·9**
4	1.3	—	1	1	—	**2**	—	0·8	0·9	—	**0·5**
	2.2+	29	16	47	1	**93**	27·4	13·0	43·5	2·6	**24·7**
	3.1+	3	2	—	—	**5**	2·8	1·6	—	—	**1·3**
5	2.3	45	33	22	32	**132**	42·5	26·9	20·4	82·0	**35·1**
	3.2+	12	15	3	1	**31**	11·3	12·2	2·8	2·6	**8·2**
	4.1+	—	1	—	—	**1**	—	0·8	—	—	**0·3**
6	2.4	—	2	—	1	**3**	—	1·6	—	2·6	**0·8**
	3.3	3	5	23	3	**34**	2·8	4·1	21·3	7·6	**9·0**
	4.2+	—	1	—	—	**1**	—	0·8	—	—	**0·3**
7	3.4	—	1	—	—	**1**	—	0·8	—	—	**0·3**
	Total...	**94**	**111**	**97**	**38**	**340**	**88·7**	**90·2**	**89·8**	**97·4**	**90·4**
Previously spawned:											
	once	10	11	10	1	**32**	9·4	9·0	9·3	2·6	**8·5**
	twice	2	1	1	—	**4**	1·9	0·8	0·9	—	**1·1**
	Total...	**12**	**12**	**11**	**1**	**36**	**11·3**	**9·8**	**10·2**	**2·6**	**9·6**
	Specimens...	**106**	**123**	**108**	**39**	**376**					

Appendix to Table 17 A.

Ahvenkoski Rapids.

		1920	1921	1922	1923	1920—1923	
Once spawned:							
5 years	2.1+G1	3	5	—	—	8	
6 years	2.1+G2	—	3	—	—	3	
	2.2+G1	2	—	3	1	6	
	3.1+G1	1	—	—	—	1	
7 years	2.3G1	1	1	6	—	8	
8 years	3.3G1	3	1	1	—	5	
9 years	3.3G2	—	1	—	—	1	
	Total...	10	11	10	1	32	(8·5%)
	Percentages...	9·4	9·0	9·3	2·6		
Twice spawned:							
8 years	2.2+G1G1	—	1	—	—	1	
9 years	2.3G1G1	2	—	—	—	2	
	3.2G1G1	—	—	1	—	1	
	Total...	2	1	1	—	4	(1.1%)

fluctuation. During the declining fishing seasons the relative quantity of re-ascending individuals naturally increases, reaching its maximum during bad salmon years, whereas during good seasons the number of previously spawned salmon sinks to a minimum. If we take into account the specimens gathered since 1925, we find that that year was a maximum year for previously spawned salmon in the Kemi River — in all 16·7% of all salmon investigated, fish ascending for the second time amounting to 14·6%. The corresponding maximum in the Oulu River specimens was in 1926: re-ascending salmon amounting to 10·4%; the number of salmon on their third ascent was particularly high (3·8%), corresponding to 10 out of the 259 specimens (total catch 312 salmon). Re-ascending salmon just touched their minimum in the Kemi River specimens in 1928 3·7% or 12 out of 322 specimens; and in the Oulu River in 1930 1·7% or 8 out of 471 specimens.

I have already observed that specimens from the salmon rivers of southern Finland do not produce the same results as regards the number of re-ascending salmon compared with the specimens from the Bothnian Bay salmon area. The former ratios are twice those of the latter. This is the case with salmon ascending the Kymi River, but also, and, indeed, particularly, the Kokemäki River (Lukkarinsanta fishing ground).

The Kymi River figures of the proportion of previously spawned salmon compared with the total salmon caught must be considered as more normal than those of the Kokemäki River: Re-ascending salmon reached a maximum in comparative quantities also at the Kymi River fishing grounds in 1924 and 1925 — Langinkoski Rapids 1924, 25·0% (36 out of 144 specimens) and 1925, 31·4% (66 out of 210 specimens); Ränninkoski Rapids 1925, 22·8% (33 out of 145 specimens). Re-ascending salmon were at a minimum at Langinkoski Rapids in 1927, 1932 and 1934 — 4·3%—4·9%; at Ränninkoski Rapids in 1927 and 1932 — 3·7% and 5·8% (the percentage in 1934 was 10·8).

Compared with salmon ascending for the first time the number of previously spawned fish was very high for several years in the Kokemäki River specimens: 1926, 17·5% (73 specimens); 1927, 32·3% (63 specimens); 1928, 23·0% (23 specimens); 1929, 22·1% (21 specimens); 1931, 28·6% (8 specimens); 1932,

12·8% (16 specimens). Only in 1925, 1930, 1934 and 1935 did the percentage of previously spawned salmon fall below 10% (varying from 4·3% in 1934 to 9·2% in 1932). I am of the opinion that the reason for the above must be sought in the following conditions: The relative abundance of re-ascending salmon during the period 1925—35 is due not only to the depreciation in the yield caused by the phenomenon of fluctuation, but also to the fact that this salmon river during the period under discussion was, so to speak, on its last legs as a salmon river. Industry has conquered this river to such an extent that its importance as a breeding ground for new generations of salmon is coming to an end. This is the reason for the sudden and rapid decline in the catches and at the same time, for the relative abundance of previously ascended and spawned salmon in the specimens.

The migratory period which is spent by salmon that have once ascended the river and then after spawning have returned to the sea before re-ascending, I have called the *intermediate migratory period*. The length of the intermediate migratory period of salmon among my specimens which have ascended the rivers on more than one occasion is shown in the following groupings (the variations in smolt-age have not been taken into consideration in these; if information on this point is required it can be found in the Appendices Tables to 12—17).

Salmon caught on their second or third ascent may be grouped according to their intermediate migratory period as follows:

In the river	Tornio	Kemi	Oulu	Kokemäki	Kymi	Total
Group						
A 1 + G . .	14	3	8	1	2	28
A 1 + G1	35	30	43	—	48	156
A 1 + G2 .	4	28	25	5	16	78
A 1 + G3		6	2	—	—	8
Total	**53**	**67**	**78**	**6**	**66**	**270**
Per mille of Grand Total.	8·6	7·0	9·7	3·7	11·1	—
Group						
A 2 + G . .	4	4	1	—	2	11
A 2 + G1	20	77	34	11	98	240
A 2 + G2	—	4	7	—	3	14
A 2 + G3	—	—	—	—	—	0
Total	**24**	**85**	**42**	**11**	**103**	**265**
Per mille of Grand Total.	3·9	8·8	5·2	6·9	17·3	—
Group						
A 3 + G . .	6	31	2	—	2	41
A 3 + G1	86	292	158	176	296	1008
A 3 G 2	—	1	1	—	1	3
A 3 G 3	—	—	—	—	—	0
Total	**92**	**324**	**161**	**176**	**299**	**1052**
Per mille of Grand Total.	14·9	33·7	20·0	109·7	50·2	—
Group						
A 4 G	—	4	2	—	—	6
A 4 G 1	9	39	35	29	9	121
A 4 G 2	—	—	—	—	—	0
Total	**9**	**43**	**37**	**29**	**9**	**127**
Per mille of Grand Total.	1·5	4·5	4·6	18·1	1·5	—
Group						
A 5 G 1	—	—	2	—	—	2
Group:						
A 1 + G 1 G 1	—	—	1	—	1	2
A 1 + G 2 G 1	—	1	1	—	1	3
Total	—	**1**	**2**	—	**2**	**5**
Per mille of Grand Total.	—	0·1	0·2	—	0·3	—

In the river:	Tornio	Kemi	Oulu	Kokemäki	Kymi	Total
Group:						
A.2+G1G+	—	1	—	—	—	1
A.2+G1G1	2	9	1	1	22	35
Total	**2**	**10**	**1**	**1**	**22**	**36**
Per mille of Grand Total	0·3	1·0	0·1	0·6	3·7	—
Group:						
A.3G1G1	8	42	33	23	60	166
Per mille of Grand Total	1·3	4·4	4·1	14·3	10·1	—
Group:						
A.4G1G1	—	1	1	2	3	7
Per mille of Grand Total	—	0·1	0·1	1·2	0·5	—

So-called descending salmon, caught during return journey after spawning:

Group:						
A.1+G		3	—	—	—	3
A.2+G	—	3	—	—	—	3
A.3G	—	18	1	—	—	19
A.4G	—	1	—	—	—	1
A.3G1G	—	3	—	—	—	3
A.G1G1G	—	—	—	—	1	1
Total	—	**28**	**1**	—	**1**	**30**
Per mille of Grand Total	—	2·8	0·1	—	0·2	—

The following list comprises 1981 individuals of previously spawned salmon; the percentages given refer to this total, 30 of which (or 1·5%) were caught on the down journey after spawning:

	Second			Third			Fourth Ascent		
	No.	%		No.	%		No.	%
A.1+G+	28	1·41	A.1+G1G1	2	0·10	—	—	—
A.1+G1(+)	156	7·88	—	—	—	—	—	—
A.1+G2	78	3·94	A.1+G2G1	3	0·15	A.1+G2G1G1	1	0·05
A.1+G3	8	0·40	—	—	—	—	—	—
Total	**270**	**13·63**		**5**	**0·25**		**1**	**0·05**
A.2+G+	11	0·56	A.2+G1G+	1	0·05	—	—	—
A.2+G1	240	12·11	A.2+G1G1	35	1·77	A.2+G1G1G1	3	0·15
A.2+G2	14	0·71	—	—	—	—	—	—
Total	**265**	**13·38**		**36**	**1·82**		**3**	**0·15**
A.3G+	41	2·07	—	—	—	—	—	—
A.3G1	1008	50·89	A.3G1G1	166	8·38	A.3G1G1G1	14	0·71
A.3G2	3	0·15	—	—	—	—	—	—
Total	**1052**	**53·11**		**166**	**8·38**		**14**	**0·71**
A.4G+	6	0·3	—	—	—	—	—	—
A.4G1	121	6·11	A.4G1G1	7	0·35	A.4G1G1G1	2	0·10
Total	**127**	**6·41**		**7**	**0·35**		**2**	**0·10**
A.5G1	2	0·1	—	—	—	—	—	—
Grand **Total**	**1716**	**86·63**		**214**	**10·8**		**20**	**1·01**

With 1 specimen ascending for the 5th time: A.1 + G + G + G + G + (0·01 %) and 30 ascending salmon (1·5 %), the total of 1981 previous spawners has been reached.

It will be seen from these tables first of all — and this, by the way, is quite natural — *that salmon which have ascended several times have generally originated in the life-cycle groups which, during the first ascent of the salmon, form the majority, i. e., are either predominant or are large complementary groups.*

The tables show, for example, that the life-cycle group A.3G1, is represented among the re-ascending salmon to the amount of 50·9 %, and the groups A.3G +, A.3G1 and A.3G2 by a total of 53·1 %. This is in absolute conformity with the part played by the group A.3 in the specimens in their entirety, the share of the A.3 group in the Bothnian Bay specimens being 50 % and in the specimens from southern Finnish rivers 12 %. Correspondingly, the groups A.2 + G and A.1 + G occupy the position of complementary groups among the re-ascending salmon, although their percentage is fairly small — 13·4 and 13·6 — i. e., 27 % combined. These main groups together represent 77·9 % of the re-ascending salmon.

The corresponding life-cycle groups of salmon which have ascended a third or fourth time also make their appearance in a predominating or major supplementary status. With regard to the former, the predominating position is held by the A.3G1G1 group (166 specimens, 8·4 %), the latter, by the A.3G1G1G1 group (14 specimens, 0·71 %). The group A.2+G1G1 occupies the position of a supplementary group among the salmon ascending for the third time (36 specimens, 1·8 %).

With regard to the length of the intermediate migratory period, it can be observed that with the great majority (89·3 %), of all re-ascending salmon, *it has lasted a full year*, i. e., *the re-ascent of the rivers occurs during the second summer after the return to the sea.*

There are, nevertheless, individuals which have made their re-ascent after two full years on their intermediate migration, but there are only 78 specimens (or 3·9 %) of this type. There are also even rarer individuals — only 8 specimens in all, corresponding to 0·4 % of re-ascending salmon — *which have spent three years before ascending a second time. It is, nevertheless, noteworthy that all have originally made their first ascent as members of the group A.1 +, i. e., while in their grilse stage and thus still young.* This phenomenon is also repeated among those fish that have spent two years on their first intermediate migration. Of these, only three specimens have originated in the group A.3, and 14 in the group A.2+, but of those ascending at an early age, 78 specimens originated in the group A.1 +. *It would therefore appear justified to state that salmon making their first ascent as grilse, are more liable than other salmon to spend a year longer on their intermediate migration.* Thus, however, with regard to salmon making their first ascent when older and weightier, occurs on very rare occasions only.

The surveys also show that there are certain re-ascending salmon which have spent only about half a year on their intermediate migration (marked +).

With regard to salmon included in this group, it should be mentioned that there has never been any definite knowledge as to whether the salmon should really have been included amongst those which have spent a full year on migration, i. e., G1 instead of G+. This group namely includes salmon in the scales of which the spawning mark is surrounded only by a "narrow" new area of growth, whereas in other fish it is wide and complete, clearly showing the summer and winter growth. Under these circumstances, I have considered it possible that the salmon included in this group have returned to the sea during the breeding autumn, and that, during the winter and spring seasons, they have become so strong and grown to such an extent that they have again ascended during the next summer season. They would thus have actually spent a longer period in the sea than that designated by the sign +, namely the preceding winter. Those salmon, on the other hand, that have spent more than a year on migration must be assumed, for the main part, to have remained in the river for the winter after spawning, and returned to the sea only during the spring floods. It should be mentioned also that there may be some uncertainty in distinguishing fish that have spent half a year, from those that have spent a full year, on their intermediate migration.

In support of the above statements on the periods of descent of kelts (spent), I would like to refer to the fact that my specimens, particularly those collected from the estuary of the Kemi River, also contain salmon that have just made their descent, and also to the indications given by certain marking results (see Järvi 1931). In these recently descended salmon, the inner edges of the scales terminate at the so-called spawning mark, without there being any indication in the scales of re-growth subsequent to absorption; in addition to this, the fish are very light in proportion to their length. Salmon of this type were represented by 26 specimens of salmon of one ascent in the Kemi River specimens for 1915—35, corresponding to 0·3 %, and of two ascents by 3 specimens. In the Oulu River specimens, they are represented by one salmon of one ascent, and in the Kymi River specimens by one fish of three ascents — in other words, very small quantities when the number of specimens is considered (see p. 57).

The following figures in respect of quantities of previously spawned salmon are given by Rosén (1918, p. 39) and Alm (1934, p. 13):

Of 163 salmon caught in 1915 in the Lule River, Rosén found 5 specimens on their second ascent, corresponding roughly to 5 %. 58 salmon caught the same year in the Pite River included 8 specimens

Table 17 B. **Division of Salmon into Life-C**

Number

Age-Classes	Life-Cycle Class	1925	1926	1927	1928	1929	1930	1931	1932	1933[1])	1934
3	1.2+	—	—	—	—	—	—	—	2	—	—
	2.1+	37	26	2	5	1	8	18	6	—	1
4	1.3	—	1	—	2	—	—	—	—	1	—
	2.2+	17	168	97	46	13	13	64	93	5	9
	3.1+	5	3	6	2	—	1	4	—	—	—
5	1.4	—	—	—	—	1	—	—	—	—	1
	2.3	19	41	183	134	66	41	11	57	66	71
	3.2+	5	8	12	4	8	4	5	16	3	2
6	2.4	17	5	—	15	15	11	5	1	2	9
	3.3	8	6	10	19	4	19	4	4	9	5
	4.2+	—	—	—	—	—	—	—	—	—	—
7	3.4	4	—	—	1	3	1	3	—	—	1
	Total...	**112**	**258**	**310**	**228**	**111**	**98**	**114**	**179**	**86**	**99**
Previously spawned:											
	once	32	12	10	15	16	8	13	8	7	9
	twice	1	—	2	4	—	1	1	3	3	3
	three times	—	1	—	—	—	—	—	—	—	—
	Total...	**33**	**13**	**12**	**19**	**16**	**9**	**14**	**11**	**10**	**12**
	Specimens...	**145**	**271**	**322**	**247**	**127**	**107**	**128**	**190**	**96**	**111**
	Catch...	**194**	**275**	**323**	**247**	**127**	**108**	**129**	**190**	**96**	**112**

[1]) See note to Table 16.

Appendix to Table 17 B.

Kymi River. Ränni and Siikasaari Rapids.

Age	Description	Specimens taken per year 1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	Total 1925—1935
	Once spawned:												
4 years	1.1+G1+	—	—	—	1	—	—	—	—	—	—	—	1
5 years	1.1+G2	—	—	—	1	—	—	—	—	—	—	—	1
	2.1+G1	1	3	3	3	3	1	—	—	1	—	—	15
6 years	2.1+G2	2	—	4	1	2	—	—	—	—	—	—	9
	2.2+G1	1	2	1	3	2	1	—	—	4	9	3	26
	2.3G+	—	—	—	—	1	1	—	—	—	—	—	2
7 years	2.2+G2	—	1	—	—	—	1	—	—	—	—	—	2
	2.3G1	26	4	1	5	6	3	10	5	1	—	8	69
	3.2+G1	1	—	—	—	—	—	—	1	1	—	—	3
8 years	2.4G1	—	—	—	—	—	1	2	—	—	—	—	3
	3.3G1	1	2	1	1	2	—	1	1	—	—	1	10
9 years	3.4G1	—	—	—	—	—	—	—	1	—	—	—	1
	Total...	32	12	10	15	16	8	13	8	7	9	12	142
	Percentages...	22·1	4·4	3·1	6·1	12·6	7·5	10·1	4·2	7·3	8·1	15·4	7·8%
	Twice spawned:												
8 years	2.2+G1G1	1	—	—	1	—	1	—	—	1	—	1	5
9 years	2.3G1G1	—	—	2	3	—	—	1	2	—	3	—	11
	3.2G1G1	—	—	—	—	—	—	—	—	2	—	—	2
10 years	3.3G1G1	—	—	—	—	—	—	—	1	—	—	—	1
	Total...	1	—	2	4	—	1	1	3	3	3	1	19 (1·0%)
	Three times spawned:												
10 years	2.2G1G1G1	—	1	—	—	—	—	—	—	—	—	—	1

es according to specimen scales. Kymi River: Siikasaari and Ränninkoski.

Percentage

1935	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1925—1935
2								1·0			—	0·1
13	25·5	9·6	0·6	2·0	0·8	7·5	14·1	[illegible]		[illegible]	11·5	6·2
4		0·4	—	0·8	—	—	—		1·0		—	0·2
85	11·7	62·0	30·1	18·6	10·2	12·2	50·0	[illegible]	[illegible]	8·1	12·8	20·4
21	3·4	1·1	1·9	0·8	—	0·9	3·1				—	1·1
2	—	—	—	—	[illegible]	—	—	—	—	[illegible]	—	0·1
19	13·2	15·1	56·9	54·3	52·0	38·3	8·6	[illegible]	[illegible]	[illegible]	38·6	39·5
71	3·4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8·4	3·1	1·8	5·1	3·9
36	11·7	1·8	—	6·1	11·8	10·3	3·9	[illegible]	2·1	8·1	7·7	4·7
92	5·5	2·2	3·1	7·7	3·1	17·8	3·1	2·1	9·4	4·5	5·1	5·0
1	—	—	—	—							1·3	0·1
14	2·8	—	—	0·4	2·4	0·9	2·4			0·9	1·3	0·8
90	77·2	95·2	98·3	92·3	87·4	91·6	89·1	94·2	89·6	89·2	83·3	91·1
42	22·1	4·4	3·1	6·1	12·6	7·6	10·1	4·2	7·3	8·1	15·4	7·8
19	0·7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1·6	3·1	2·7	1·3	1·0
1		[illegible]									—	0·1
62	22·8	4·8	3·7	7·7	12·6	8·4	10·9	5·8	10·4	10·8	16·7	8·9
22												
82												

Appendix (B) to Tables 13, 14 and 16: Descending Salmon (Kelts).

Age	Description	Specimens taken per year 1915	1923	1928	1932	1933	1934	1935	Total 1915—1935
	Kemi River.								
	Once spawned:								
5 years	2.2+6	—	—	—	—	1	—	—	1
	3.1+6	—	—	—	—	3	—	—	3
6 years	2.3G	—	—	—	1	1	1	—	3
7 years	3.3G	1	—	—	1	8	1	—	11
	4.2G	—	—	—	1	—	—	—	1
8 years	3.4G	—	1	—	—	—	—	—	1
	4.3G	—	—	—	—	3	1	—	4
	Total...	1	1	—	3	16	3	—	24 (0·3%)
	Twice spawned:								
9 years	3.3G1G	—	—	—	1	1			2
	Oulu River.								
	Once spawned:								
7 years	3.3G	—	—	—	—	—		1	1
	Kymi River. Langinkoski Rapids.								
	Three times spawned:								
10 years	2.3G1G1G	—	—	1	—	—			1

Table 18. **River- and Sea-Life. Combinations of Tables 12—17.**

Tornio River (1930—1935)

Smolt-Age	In Sea A.1+	A.2+	A.3+	A.4+	A.5+	Total	In Sea A.1+	A.2+	A.3+	A.4+	A.5+	Total
	Number						Percentage					
2	21	16	49	7	1	**94**	0·3	0·2	0·8	0·1	0·02	**1·5**
3	996	1530	1439	147	20	**4132**	16·1	24·7	23·2	2·4	0·3	**66·7**
4	495	828	312	38	1	**1674**	8·0	13·4	5·0	0·6	0·02	**27·0**
5	66	23	3	—	—	**92**	1·1	0·4	0·05	—	—	**1·5**
Total...	**1578**	**2397**	**1803**	**192**	**22**	**5992**	**25·5**	**38·7**	**29·1**	**3·1**	**0·3**	**96·8**
Others[1])...						**200**						**3·2**

Kemi River (1915—1935)

2	20	167	514	70	7	**778**	0·2	1·8	5·3	0·7	0·1	**8·1**
3	339	1918	4138	568	66	**7029**	3·5	19·9	43·0	5·9	0·7	**73·0**
4	87	421	610	60	2	**1180**	0·9	4·4	6·3	0·6	0·02	**12·3**
5	12	9	3	1	—	**25**	0·1	0·1	0·03	0·01	—	**0·2**
Total...	**458**	**2515**	**5265**	**699**	**75**	**9012**	**4·8**	**26·1**	**54·7**	**7·2**	**0·8**	**93·6**
Others[2])...						**618**						**6·4**

Oulu River (1917—1935)

2	67	159	708	156	10	**1100**	0·8	2·0	8·8	1·9	0·1	**13·7**
3	281	766	3889	873	62	**5871**	3·5	9·5	48·3	10·9	0·8	**73·0**
4	41	109	443	97	6	**696**	0·5	1·4	5·5	1·2	0·1	**8·7**
5	4	2	5	—	1	**12**	0·04	0·02	0·1	—	0·01	**0·1**
Total...	**393**	**1036**	**5045**	**1126**	**79**	**7679**	**4·9**	**12·9**	**62·7**	**14·0**	**1·0**	**95·5**
Others[3])...						**366**						**4·5**

Kokemäki River (1925—1935)

2	2	76	838	220	10	**1146**	0·1	4·7	52·2	13·7	0·6	**71·4**
3	2	31	134	35	—	**202**	0·1	1·9	8·4	2·2	—	**12·6**
4	—	—	2	1	—	**3**	—	—	0·1	0·1	—	**0·2**
5	—								—	—	—	—
Total...	**4**	**107**	**974**	**256**	**10**	**1351**	**0·2**	**6·7**	**60·7**	**16·0**	**0·6**	**84·2**
Others[4])...						**254**						**15·8**

Kymi River: Langinkoski Rapids (1920—1925)

1	3	2	9	2	—	**16**	0·1	0·1	0·2	0·1	—	**0·4**
2	289	967	1472	262	5	**2995**	7·7	25·7	39·1	7·0	0·1	**79·6**
3	41	131	171	32	1	**376**	1·1	3·5	4·5	0·8	0·03	**10·0**
4	—	—	2	—	—	**2**	—	—	0·1	—	—	**0·1**
Total...	**333**	**1100**	**1654**	**296**	**6**	**3389**	**8·8**	**29·2**	**44·0**	**7·9**	**0·2**	**90·1**
Others						**373**						**9·9**

Kymi River: Ahvenkoski, Siikasaari and Ränninkoski Rapids (1920—1935)

1	—	2	6	2	—	**10**	—	0·1	0·3	0·1	—	**0·5**
2	150	628	851	89	—	**1718**	6·8	28·6	38·7	4·0	—	**78·2**
3	26	102	126	15	—	**269**	1·2	4·6	5·7	0·7	—	**12·2**
4	1	2	—	—	—	**3**	0·05	0·1	—	—	—	**0·1**
Total...	**177**	**734**	**983**	**106**	—	**2000**	**8·1**	**33·4**	**44·7**	**4·8**	—	**91·0**
Others...						**198**						**9·0**

[1]) omitted from table: life-classes 4+ (4 spec.) and 5+ (5 spec.)
[2]) also life-classes 3+ (1 spec.), 4+ (1 spec.), 5+ (9 spec.), and 1.3 (1 spec.)
[3]) also life-classes 3+ (1 spec.), 4+ (3 spec.), and 3.6 (2 spec.)
[4]) also life-class 1.3 (1 spec.)

} in addition all previously spawned.

(13·8%), while 11 salmon from the Kalix River in 1915 included one specimen on its second, and one specimen, at least, on its third, ascent. 20 salmon caught in the same river in 1916 included one previously spawned individual, whereas of 20 fish caught in the Tornio River in 1916, not one had spawned previously. The author considers the results from the Pite River to be quite exceptional.

Alm's observations will be seen from the following figures:

Previously spawned Salmon.

	once	twice	total	% of salmon invest.	Individuals invest.
Rivers					
Kalix (1928—31)	5	1	6	2·9	205
Lule (1928—31)	9	1	10	5·8	171
Sea.					
Västerbotten (1930—32)	36	1	37	4·9	763
Västernorrland (1930—32)	6	—	6	2·9	202
Total...	56	3	59	4·4	1341
Rivers					
Ume (1930—31)	6	—	6	3·8	155
Ångerman (1925—28, 31)	42	2	44	9·1	480
Indal (1927—29, 1931—32)	37	3	40	10·3	390
Ljung (1926—27)	10	—	10	15·6	64
Total...	95	5	100	9·2	1089
Rivers					
Ljusne (1926—27, 1929—32)	50	1	51	11·7	436
Dal (1928—31)	15	—	15	6·6	228
Sea					
Gävleborg (1930—32)	7	—	7	7·9	89
Total...	72	1	73	9·7	753
Gothland (1932), sea	6	—	6	3·9	154
Mörrum (1926—32), river	13	—	13	2·8	468
Sea.					
Blekinge (1925—26, 1931)	9	—	9	3·3	269
Kristianstad (1932—33)	6	—	6	2·6	231
Bornholm (1932)	10	—	10	7·0	142
Total...	38	—	38	3·6	1070
Malmöhus (1929—33), sea	1	—	1	0·1	760

Dixon (1934) gives (on page 73) the number of previously spawned salmon among his specimens as follows: "Of the material analysed, 15% of the drift-net salmon and 22% of the line-caught were found to possess distinct spawning marks. The period of marine existence preceding the first spawning migration is as follows: 1 year = 16%, 2 years = 62%, 3 years = 22%." As his material consists of 464 salmon caught with the drift-net and 97 caught with the line during the years 1928, 1931—33, 15% of the former is equal to 69 or 70 fish. His material thus appears to have contained 90 previously spawned salmon apportioned as follows: one year marine existence (ascent and spawning have occurred during the second summer after the descent from the river) — 14 specimens; two years marine existence (spawning on third) — 56 specimens; and three years marine existence (spawning on fourth migration year) — 20 specimens.

Judging from the many years which certain of the salmon among their material have spent in the sea (71 specimens 5 years, 12 specimens 6 years, 1 specimen 7 years and 1 specimen no less than 10 years), Willer and Quednau's (1934) material has also contained previously ascended and spawned individuals — possibly just the quantity represented by the above fish among their material of 1127 specimens, (if this is indeed the case, the number of spawned salmon would correspond to 7·5%, a figure which appears very feasible).

The figures concerning previously ascended and spawned salmon which I have borrowed from the publications of Rosén, Dixon and Willer and Quednau, should not perhaps be used as a basis of comparison, as, on the one hand (Rosén, Dixon), they are derived from restricted material, and, on the other (Willer and Quednau), they are not given in sufficient detail. I would like to point out the extreme uniformity of Alm's figures, compared with my own results. The proportion of previously spawned salmon among the material collected from the Bothnian Bay (Torne, Kemi and Oulu Rivers) is 4·9%. Alm's figures from the combined material of the Kalix and Lule Rivers, together with Västerbotten and Västnorrland, are 4·4%. Alm's material from the Ume, Ångerman, Indal and Ljung Rivers yield a combined figure of 9·2% previously spawned salmon, and 9·7% for the Ljusne and Dal Rivers and the Gävleborg sea fishing. My result for the Kymi River is 9·6%. Alm's results for Gothland and the southern parts of the Baltic (Mörrum River, Blekinge, Kristiansand, Bornholm) produce 3·6%, which is not very different from the figures for the Bothnian Bay salmon areas (both Finnish and Swedish waters) — 4·9% and 4·4%. The result of only 0·1% yielded by Alm's material collected from the Malmöhus district, and the result from the Kokemäki River in Finland, the reasons for which I have endeavoured to point out before, must be considered as exceptional.

5. Age of Salmon.

The accurate determining of the age of salmon is only important in so far as it provides a guide to placing them in particular year-classes. In other respects, the grouping of salmon on the basis of their age causes complications, as the smolt-age fluctuates, and as the effect of this stage of development is not apparent

Table 19. Smolt-Age of the Ascending Salmon.

Year	1.B	2.B	3.B	4.B	5.B	Total	1.B	2.B	3.B	4.B	5.B
Tornio River.			Number						Percentage		
1930	—	6	328	140	9	**483**	—	1·2	67·9	29·0	1·9
1931	—	15	672	341	4	**1032**	—	1·5	65·1	33·0	0·4
1932		8	335	154	1	**498**	—	1·6	67·3	30·9	0·2
1933	—	21	696	328	10	**1055**	—	2·0	66·0	31·1	0·9
1934	—	25	1540	603	69	**2237**	—	1·1	68·8	27·0	3·1
1935	—	25	687	171	4	**887**	—	2·8	77·5	19·3	0·4
	0	**100**	**4258**	**1737**	**97**	**6192**	**0**	**1·6**	**68·8**	**28·0**	**1·6**
Kemi River.[1])											
1922		9	104	38	1	**152**	—	5·9	68·4	25·0	0·7
1923		18	45	7	—	**70**	—	25·7	64·3	10·0	—
1924		20	53	2	—	**75**	—	26·7	70·7	2·6	—
1925		42	359	23	—	**424**	—	9·9	84·7	5·4	—
1926	—	15	189	16	—	**220**	—	6·8	85·9	7·3	—
1927	—	14	149	8	—	**171**	—	8·2	87·1	4·7	—
1928	—	13	303	6	—	**322**	—	4·0	94·1	1·9	—
1929	—	30	499	58	—	**587**	—	5·1	85·0	9·9	—
1930	—	39	486	69	—	**594**	—	6·6	81·8	11·6	—
1931		11	176	22	1	**210**	—	5·2	83·8	10·5	0·5
1932	—	78	648	259	4	**989**	—	7·9	65·5	26·2	0·4
1933	—	275	1098	166	3	**1542**	—	17·8	71·2	10·8	0·2
1934	—	90	2086	305	21	**2502**	—	3·6	83·4	12·2	0·8
1935	—	166	1248	276	5	**1695**	—	9·8	73·6	16·3	0·3
	0	**820**	**7443**	**1255**	**35**	**9553**	**0**	**8·6**	**77·9**	**13·1**	**0·4**
Oulu River.											
1917	—	30	264	14	—	**308**	—	9·8	85·7	4·5	—
1918	—	10	52	4	—	**66**	—	15·1	78·8	6·1	—
1919	—	14	62	16	—	**92**	—	15·2	67·4	17·4	—
1920	—	6	40	6	—	**52**	—	11·5	77·0	11·5	—
1921	—	6	45	17	1	**69**	—	8·7	65·2	24·6	1·5
1922	—	1	22	2	—	**25**	—	4·0	88·0	8·0	—
1923	—	17	75	18	—	**110**	—	15·4	68·2	16·4	—
1924	—	11	53	9	—	**73**	—	15·1	72·6	12·3	—
1925	—	30	217	10	—	**257**	—	11·7	84·4	3·9	—
1926	—	61	187	11	—	**259**	—	23·6	72·2	4·2	—
1927	—	51	600	28	—	**679**	—	7·5	88·4	4·1	—
1928	—	31	336	27	—	**394**	—	7·9	85·3	6·8	—
1929	—	20	270	26	1	**317**	—	6·3	85·2	8·2	0·3
1930	—	85	360	26	—	**471**	—	18·4	76·4	5·5	—
1931	—	44	403	35	—	**482**	—	9·1	83·6	7·3	—
1932	—	80	695	148	1	**924**	—	8·7	75·2	16·0	0·1
1933	—	215	640	155	4	**1014**	—	21·2	63·1	15·3	0·4
1934	—	198	1060	110	1	**1369**	—	14·4	77·4	8·0	0·2
1935	—	242	774	64	4	**1084**	—	22·3	71·4	5·9	0·4
	0	**1152**	**6155**	**726**	**12**	**8045**	**0**	**14·3**	**76·5**	**9·0**	**0·2**
Kokemäki River.											
1925	—	195	37	—	—	**232**	—	84·1	15·9	—	—
1926	1	381	36	—	—	**418**	0·2	91·2	8·6	—	—
1927	—	170	25	—	—	**195**	—	87·2	12·8	—	—
1928	—	73	26	1	—	**100**	—	73·0	26·0	1·0	—
1929	—	72	22	1	—	**95**	—	75·8	23·2	1·0	—
1930	—	107	13	—	—	**120**	—	89·2	10·8	—	—
1931	—	23	5	—	—	**28**	—	82·1	17·9	—	—
1932	—	58	24	1	—	**83**	—	69·9	28·9	1·2	—
1934	—	145	17	—	—	**162**	—	89·5	10·5	—	—
1935	—	149	23	—	—	**172**	—	86·6	13·4	—	—
	1	**1373**	**228**	**3**	—	**1605**	**0·1**	**85·5**	**14·2**	**0·2**	**0**

[1]) Incl. Valkeakari in Kemi Estuary.

Table 19 (continued).

Year	1.B	2.B	3.B	4.B	5.B	Total	1.B	2.B	3.B	4.B	5.B
Kymi River.			Number						Percentage		
1920	1	199	38	—	—	238	0·4	83·6	16·0	—	
1921	3	269	54	2		328	0·9	82·0	16·5	0·6	
1922	4	186	37			227	1·8	81·9	16·3	-	
1923	1	139	8			148	0·7	93·9	5·4		
1924		134	10	—	—	144	—	93·1	6·9	—	—
1925		305	50			355	-	85·9	14·1		
1926	2	657	62			721	0·3	91·1	8·6	—	—
1927	1	737	73			811	0·1	90·9	9·0	—	—
1928	9	517	68			594	1·5	87·0	11·5	—	—
1929	2	377	43	—	—	422	0·5	89·3	10·2		
1930		209	51			260	—	80·4	19·6		
1931	1	370	57			428	0·2	86·5	13·3		
1932	2	516	68	2		588	0·3	87·8	11·6	0·3	
1933	1	97	19	—	—	117	0·9	82·9	16·2	—	—
1934	1	289	27	—		317	0·3	91·2	8·5	—	
1935		215	46	1		262	—	82·1	17·5	0·4	—
	28	5216	711	5	0	5960	0·5	87·5	11·9	0·1	0

Table 20. **The Life-Cycle Classes of the Ascending Salmon.**

Years and Catch Years	First time ascending														Previously spawned									Specimens	Catch
	A.1	A.2	A.3	A.4	A.5	A.6	Total	A.1	A.2	A.3	A.4	A.5	A.6	Total	once	twice	3 times	Total	once	twice	3 times	Total			
ornio River.	Individuals							Percentage							Individuals				Percentage						
30	103	142	158	56	4	—	463	21·4	29·4	32·7	11·6	0·8		95·9	19	1	—	20	3·9	0·2	—	4·1	483	—
31	109	586	243	47	9	—	994	10·6	56·8	23·5	4·5	0·9		96·3	34	4	—	38	3·3	0·4	—	3·7	1032	
32	190	121	141	28	2	—	477	38·2	24·3	28·3	4·6	0·4	—	95·8	20	1	-	21	4·0	0·2	—	4·2	498	
33	436	405	160	29	1	—	1031	41·3	38·4	15·2	2·7	0·1	—	97·7	23	—	1	24	2·2	—	0·1	2·3	1055	-
34	360	939	833	26	4	—	2171	16·1	42·0	37·2	1·1	0·2	—	97·0	61	3	2	66	2·8	0·1	0·1	3·0	2237	—
35	380	204	268	11	2	—	865	42·9	23·0	30·2	1·2	0·2	—	97·5	21	1	—	22	2·4	0·1	—	2·5	887	—
Total...	1578	2807	1808	192	22	—	6001	25·5	38·7	29·1	3·1	0·4	—	96·9	178	10	3	191	2·9	0·2	0·04	3·1	6192	
emi River.																									
15	—	26	29	4	—	—	59	—	41·9	46·8	6·5	—		95·2	2	1	—	3	3·2	1·6	—	4·8	62	—
22	3	17	113	12	—	—	145	2·0	11·2	74·3	7·9	—	—	95·4	7	—	--	7	4·6	—	—	4·6	152	1414[6]
23	—	18	33	12	1	—	59	—	18·6	47·1	17·2	1·4		84·3	11	—	—	11	15·7	—	—	15·7	70	459
24	—	2	32	31	1	—	66	—	2·7	42·7	41·3	1·3	—	88·0	9	—	--	9	12·0	—	—	12·0	75	616
25	47	93	95	92	26	—	353	11·1	21·9	22·5	21·7	6·1	—	83·3	62	8	1	71	14·6	1·9	0·2	16·7	424	852
26	26	98	62	15	1	—	202	11·8	44·5	28·2	6·8	0·5		91·8	14	4	—	18	6·4	1·8	—	8·2	220	252
27	9	63	89	3	—	—	164	5·3	36·8	52·0	1·8	—		95·9	3	4	--	7	1·8	2·3	—	4·1	171	374
28	9	56	186	49	10	—	310	2·8	17·4	57·8	15·2	3·1		96·3	11	1	—	12	3·4	0·3	—	3·7	322	75
29	3	40	370	122	10	—	545	0·5	6·8	63·0	20·8	1·7	—	92·8	39	3		42	6·7	0·5	—	7·2	587	373
30	98	110	202	128	13	—	551	16·5	18·5	34·0	21·6	2·2		92·8	41	2	—	43	6·9	0·3	—	7·2	594	—
31	9	74	89	21	1	—	194	4·3	35·2	42·4	10·0	0·5		92·4	14	1	1	16	6·6	0·5	0·5	7·6	210	—
32	45	218	591	48	4	—	906	4·6	22·0	59·6	4·9	0·4		91·5	72	10	—	88	7·4	1·0	—	8·5	989	—
33	11	815	587	47	2	—	1462	0·7	52·9	38·1	3·0	0·1	—	94·8	72	8	-	80	4·7	0·5	—	5·2	1542	—
34	165	502	1627	63	5	—	2378	6·6	20·1	65·0	2·5	0·2	—	94·8	119	9	1	129	4·8	0·4	0·03	5·2	2502	-
35	18	388	1161	52	1	—	1620	1·1	22·9	68·5	3·1	0·05		95·6	69	5	1	75	4·1	0·3	0·05	4·4	1695	—
Total ...	443	2515	5266	699	75		9009	4·6	26·2	54·8	7·2	0·8	—	93·7	545	56	4	606	5·7	0·6	0·04	6·3	9615	

[1]) The specimens also contain 9 individuals from life-class A.+, which are included in the total.
[2]) Of the Korva catch ([illegible] ind.) 64 are recorded in column "Specimens", the remaining 258 are from Kaihus
[3]) Of the Korva catch [illegible] 370 are recorded in column "Specimens", the remaining 217 from Valkeakari.
[4]) Column "Specimens" also contains one ind. from the age-class 4.2G1G1G1G1, which is included in the total.
[5]) Column "Specimens" also contains 11 ind. from life-class A.+, which are included in the total.
[6]) Catch in the years 1922—28 from Korwa Weir only.

(continued on p. 62).

Table 20 (continued).

Areas and Catch Years	First time ascending													Previously spawned									Specimens	Catch
	A.1+	A.2+	A.3	A.4	A.5	A.6	Total	A.1+	A.2+	A.3	A.4	A.5	A.6	Total	once	twice	3 times	Total	once	twice	3 times	Total		
Oulu River.	Individuals							Percentage							Individuals				Percentage					
1917	12	20	243	22	—	—	**297**	3·9	6·5	78·9	7·1	—	—	**96·4**	11	—	—	**11**	3·6	—	—	**3·6**	**308**	—
1918	9	3	30	14	—	—	**56**	13·6	4·5	45·5	21·2	—	—	**84·8**	10	—	—	**10**	15·2	—	—	**15·2**	**66**	—
1919	1	41	27	15	2	—	**86**	1·1	44·6	29·3	16·3	2·2	—	**93·5**	6	—	—	**6**	6·5	—	—	**6·5**	**92**	—
1920	20	6	23	3	—	—	**52**	38·5	11·5	44·2	5·8	—	—	**100·0**	—	—	—	—	—	—	—	—	**52**	—
1921	4	29	29	6	—	—	**68**	5·8	42·0	42·0	8·7	—	—	**98·5**	1	—	—	**1**	1·5	—	—	**1·5**	**69**	71
1922		4	17	3	—	—	**24**	—	16·0	68·0	12·0	—	—	**96·0**	—	1	—	**1**	—	4·0	—	**4·0**	**25**	60
1923		2	50	48	—	—	**100**	—	1·8	45·5	43·6	—	—	**91·0**	10	—	—	**10**	9·1	—	—	**9·1**	**110**	37
1924			26	39	2	—	**67**	—	—	35·6	53·4	2·8	—	**91·8**	6	—	—	**6**	8·2	—	—	**8·2**	**73**	65
1925	1	35	123	61	15	—	**235**	0·4	13·6	47·9	23·7	5·8	—	**91·4**	18	4	—	**22**	7·0	1·6	—	**8·6**	**257**	69
1926	2	64	109	51	5	1	**232**	0·8	24·7	42·1	19·7	1·9	0·4	**89·6**	16	10	1	**27**	6·2	3·8	0·4	**10·4**	**259**[1]	51
1927		29	578	46	2	—	**655**	—	4·3	85·1	6·8	0·2	—	**96·4**	18	6	—	**24**	2·7	0·9	—	**3·6**	**679**[2]	123
1928	9	40	232	99	2	—	**382**	2·3	10·2	58·9	25·1	0·5	—	**97·0**	12	—	—	**12**	3·0	—	—	**3·0**	**394**	45
1929		13	215	74	2	—	**304**	—	4·1	67·8	23·4	0·6	—	**95·9**	13	—	—	**13**	4·1	—	—	**4·1**	**317**	33
1930	2	64	238	150	9	—	**463**	0·4	13·6	50·6	31·8	1·9	—	**98·3**	8	—	—	**8**	1·7	—	—	**1·7**	**471**	56
1931		112	248	93	4	—	**457**	—	23·2	51·5	19·3	0·8	—	**94·8**	21	4	—	**25**	4·4	0·8	—	**5·2**	**482**	48
1932		116	700	68	4	—	**888**	—	12·5	75·8	7·4	0·4	—	**96·1**	34	2	—	**36**	3·7	0·2	—	**3·9**	**924**	107
1933	139	133	597	94	12	1	**977**	13·7	13·1	58·9	9·3	1·2	0·1	**96·4**	34	3	—	**37**	3·3	0·3	—	**3·6**	**1014**[3]	131
1934	166	107	910	127	10	—	**1323**	12·1	7·8	66·5	9·3	0·7	—	**96·6**	41	4	1	**46**	3·0	0·3	0·1	**3·4**	**1369**[4]	161
1935	28	218	650	113	10	—	**1019**	2·6	20·1	60·0	10·4	0·9	—	**94·0**	62	3	—	**65**	5·7	0·3	—	**6·0**	**1084**	108
Total..	**393**	**1036**	**5045**	**1126**	**79**	**2**	**7685**	**4·9**	**12·9**	**62·7**	**14·0**	**1·0**	**0·02**	**95·5**	**321**	**37**	**2**	**360**	**4·0**	**0·5**	**0·02**	**4·5**	**8045**	
Kokemäki River.																								
1925	1	12	148	51	—	—	**212**	0·4	5·1	63·8	22·0	—	—	**91·3**	19	1	—	**20**	8·3	0·4	—	**8·7**	**232**	59
1926	2	22	242	77	2	—	**345**	0·5	5·2	57·9	18·4	0·5	—	**82·5**	64	8	1	**73**	15·3	2·0	0·2	**17·5**	**418**	43
1927		6	100	24	2	—	**132**	—	3·1	51·3	12·3	1·0	—	**67·7**	62	1	—	**63**	31·8	0·5	—	**32·3**	**195**	20
1928		4	43	29	1	—	**77**	—	4·0	43·0	29·0	1·0	—	**77·0**	14	7	2	**23**	14·0	7·0	2·0	**23·0**	**100**	10
1929		6	49	18	1	—	**74**	—	6·3	51·6	19·0	1·0	—	**77·9**	17	4	—	**21**	17·9	4·2	—	**22·1**	**95**	10
1930		2	94	13	—	—	**109**	—	1·7	78·3	10·8	—	—	**90·8**	9	2	—	**11**	7·5	1·7	—	**9·2**	**120**	12
1931	1	6	3	9	1	—	**20**	3·6	21·4	10·7	32·1	3·6	—	**71·4**	7	—	1	**8**	25·0	—	3·6	**28·6**	**28**	2
1932		9	54	4	—	—	**67**	—	10·8	65·1	4·8	—	—	**80·7**	14	1	1	**16**	16·9	1·2	1·2	**19·3**	**83**	8
1934		12	130	12	1	—	**155**	—	7·4	80·3	7·4	0·6	—	**95·7**	5	2	—	**7**	3·1	1·2	—	**4·3**	**162**	17
1935		28	112	19	2	—	**161**	—	16·3	65·1	11·0	1·2	—	**93·6**	11	—	—	**11**	6·4	—	—	**6·4**	**172**	18
Total...	**4**	**107**	**975**	**256**	**10**	—	**1352**	**0·2**	**6·7**	**60·7**	**15·9**	**0·7**	—	**84·2**	**222**	**26**	**5**	**253**	**13·9**	**1·6**	**0·3**	**15·8**	**1605**	
Kymi River: Langinkoski.																								
1920	26	66	39	1	—	—	**132**	19·7	50·0	29·5	0·8	—	—	**100·0**	—	—	—	—	—	—	—	—	**132**	—
1921	47	47	77	13	—	—	**184**	22·9	22·9	37·6	6·4	—	—	**89·8**	16	5	—	**21**	7·8	2·4	—	**10·2**	**205**	26
1922		26	54	6	—	—	**86**	—	21·9	45·4	5·0	—	—	**72·3**	32	1	—	**33**	26·9	0·8	—	**27·7**	**119**	83
1923		3	89	9	—	—	**101**	—	2·8	81·6	8·2	—	—	**92·6**	5	3	—	**8**	4·6	2·8	—	**7·4**	**109**	83
1924	2	9	70	27	—	—	**108**	1·4	6·3	48·6	18·7	—	—	**75·0**	32	4	—	**36**	22·2	2·8	—	**25·0**	**144**	45
1925	1	37	68	38	—	—	**144**	0·5	17·6	32·4	18·1	—	—	**68·6**	62	4	—	**66**	29·5	1·9	—	**31·4**	**210**	32
1926	82	243	71	16	1	—	**413**	18·2	54·0	15·8	3·6	0·2	—	**91·8**	24	13	—	**37**	5·3	2·9	—	**8·2**	**450**	45
1927	18	136	302	12	—	—	**468**	3·7	27·8	61·7	2·5	—	—	**95·7**	15	6	—	**21**	3·1	1·2	—	**4·3**	**489**	49
1928	13	72	201	36	1	—	**323**	3·7	20·8	57·9	10·4	0·3	—	**93·1**	19	3	2	**24**	5·5	0·9	0·5	**6·9**	**347**	34
1929	13	45	173	36	1	—	**268**	4·4	15·3	58·7	12·2	0·3	—	**90·9**	21	5	1	**27**	7·1	1·7	0·3	**9·1**	**295**	29
1930	8	9	82	41	—	—	**140**	5·2	5·9	53·6	26·8	—	—	**91·5**	12	1	—	**13**	7·8	0·7	—	**8·5**	**153**	15
1931	68	131	40	14	2	—	**255**	22·7	43·6	13·3	4·7	0·7	—	**85·0**	37	8	—	**45**	12·3	2·7	—	**15·0**	**300**	30
1932	32	221	121	5	—	—	**379**	8·0	55·5	30·4	1·3	—	—	**95·2**	10	8	1	**19**	2·5	2·0	0·3	**4·8**	**398**	39
1933		4	17	—	—	—	**21**	—	19·0	81·0	—	—	—	**100·0**	—	—	—	—	—	—	—	—	**21**	2
1934	10	32	140	13	1	—	**196**	4·9	15·5	67·9	6·3	0·5	—	**95·1**	7	2	1	**10**	3·4	1·0	0·5	**4·9**	**206**	13
1935	13	19	110	29	—	—	**171**	7·1	10·3	59·8	15·7	—	—	**92·9**	11	1	1	**13**	6·0	0·5	0·5	**7·1**	**184**	18
Total...	**333**	**1100**	**1654**	**296**	**6**	—	**3389**	**8·9**	**29·2**	**44·0**	**7·9**	**0·1**	—	**90·1**	**303**	**64**	**6**	**373**	**8·1**	**1·7**	**0·1**	**9·9**	**3762**	

Table 20 (continued).

Years of Catch	First time ascending												Previously spawned												Total
	Individuals						Percentage						Individuals				Percentage								
venkoski.																									
	5	41	48	—	—	—	9·4	4·7	38·7	45·3	—	—	—	88·7	10	2	—	12	9·4	1·9	—	—	11·3	106
	6	42	39	3	—	—	11·1	30·1	26·0	31·7	2·4	—	—	90·2	11	1	—	12	9·0	0·8	—	—	9·8	123
	1	39	46	—	—	—	0·9	46·3	42·6	—	—	—	—	89·8	10	1	—	11	9·3	0·9	—	—	10·2	108
	—	2	35	1	—	—	—	5·1	89·7	2·6	—	—	—	97·4	1	—	—	1	2·6	—	—	—	2·6	39
Total	43	125	168	4	—	—	11·4	33·2	44·7	1·1	—	—	—	90·4	32	4	—	36	8·5	1·1	—	—	9·6	376
ninkoski and Siikasaarenkoski.																									
	42	32	27	21	—	—	28·9	15·2	18·6	14·5	—	—	—	77·2	32	1	—	33	22·1	0·7	—	—	22·8	145
	20	15	48	5	—	—	10·7	65·0	17·7	1·8	—	—	—	95·2	12	—	1	13	4·4	—	0·4	—	4·8	271
	8	109	193	—	—	—	2·5	33·9	59·9	—	—	—	—	96·3	10	2	—	12	3·1	0·6	—	—	3·7	322
	7	50	155	16	—	—	2·8	20·2	62·8	6·5	—	—	—	92·3	15	4	—	19	6·1	1·6	—	—	7·7	247
	1	21	70	19	—	—	0·8	16·5	55·1	15·0	—	—	—	87·4	16	—	—	16	12·6	—	—	—	12·6	127
	9	17	60	12	—	—	3·8	15·9	56·1	11·2	—	—	—	91·0	8	1	—	9	7·5	0·9	—	—	8·4	107
	22	69	15	8	—	—	17·2	53·9	11·7	6·3	—	—	—	89·1	13	1	—	14	10·1	0·8	—	—	10·9	128
	6	111	61	1	—	—	3·2	58·4	32·1	0·5	—	—	—	94·2	8	3	—	11	4·2	1·6	—	—	5·8	190
	—	8	76	2	—	—	—	8·3	79·2	2·1	—	—	—	89·6	7	3	—	10	7·3	3·1	—	—	10·4	96
	1	11	76	11	—	—	0·9	9·9	68·5	9·9	—	—	—	89·2	9	3	—	12	8·1	2·7	—	—	10·8	111
	9	15	34	7	—	—	11·5	19·2	43·6	9·0	—	—	—	83·3	12	1	—	13	15·4	1·3	—	—	16·7	78
Total	134	609	815	102			7·4	33·4	44·7	5·6				91·1	112	19	1	132	7·8	1·0	0·1		8·9	1822

) Pyhäkoski Rapids 173, Maljala 86 ind.
) " " 312, " 202 "
" " 488, " 191

later — at least only to a very insignificant extent — in the size, weight and commercial value of the salmon. These facts, actually, are most closely dependent on the life-cycle group to which the salmon belong during their marine existence. In spite of this, I have prepared a table — No. 21 — concerning the age of salmon among my material. I have put them into two main groups: those ascending for the first time, and previously spawned salmon. The result is as follows:

(See p. 64).

Table 21 shows that the mean age of salmon ascending for the first time among my specimens was as follows: Tornio River 5·4 years (excluding year of ascent), Kemi area 5·8, Oulu River 5·9, Kokemäki River 5·3, and Kymi River only 4·7 years. The lower mean age of the Kymi River salmon is due principally to a shorter smolt-age. Taking the mean age of previously spawned salmon re-ascending, even more uniform figures are obtained: Tornio River 7·6, Kemi area 7·9, Oulu River 7·8, Kokemäki River 7·4 and Kymi River 7·1 years. The comparative high mean age (despite their short smolt-age) of salmon from the last-named river is derived mainly from the relative large number of salmon which have ascended twice before.

There are, of course, annual fluctuations in the mean ages, due to variations in the formation of the stock. The lowest figures for salmon ascending for the first time were noted in the following years:— Tornio River 1933 and 1935 (both 5·1 years); Kemi area 1933 (5·4 years) and 1927 (5·5 years); Oulu River 1920 (5·2 years) and 1933—35 (5·7 years); Kokemäki River 1931 and 1933 (5·1 years), and Kymi River 1931 (4·2 years). The highest mean ages among salmon on their first ascent were:— Tornio River 1930 (5·7 years); Kemi River 1928 and 1929 (6·0 and 6·2 years); Oulu River 1925, 1927—32 (6·0—6·2 years); Kokemäki River 1928 (5·6 years), and Kymi River 1924 and 1930 (5·2 years). The lowest mean ages among previously spawned salmon occurred in the Kokemäki River in 1935 (6·8 years) and the Kymi River 1920—22 (6·8 years) and 1924 (6·7 years). The highest mean ages among previously spawned salmon occurred in the Tornio River 1931 (8·6 years); Kemi River 1925 and 1926 (8·6 years), and 1931 (8·5 years); Oulu River (since 1925) 1926 (8·9 years) and 1931 (8·5 years); Kokemäki River 1928 (8·4 years), and Kymi River 1932 (7·9 years).

Salmon ascended for First Time.

Age (excluding ascending year)

Bothnian Bay Salmon.

Number

Years...	3	4	5	6	7	8	9	10	Total	All specimens
Tornio (1930—35) ..	21	1016	2079	2340	483	61	1	—	6001	6192
Kemi (1922—35) ...	21	480	2513	4615	1190	128	3	—	8950	9553
Oulu (1917—35)....	68	443	1515	4158	1328	164	8	1	7685	8045
Total...	110	1939	6107	11113	3001	353	12	1	22636	23790

Percentage

Tornio.....	0·3	16·4	33·6	37·8	7·8	1·0	0·02	—	96·9
Kemi.....	0·2	5·0	26·3	48·3	12·5	1·4	0·03	—	93·7
Oulu.....	0·9	5·5	18·8	51·7	16·5	2·0	0·1	0·01	95·5
Total...	0·5	8·1	25·7	46·7	12·6	1·5	0·05	0·004	95·1

Southern Finnish Salmon.

Number

Years...	2	3	4	5	6	7	8	Total	All specimens
Kokemäki (1925—35)	—	2	79	869	354	47	1	1352	1605
Kymi (1920—35)	3	443	1677	2561	650	54	1	5389	5960
Total...	3	445	1756	3430	1004	101	2	6741	7565

Percentage

Kokemäki.....	—	0·1	4·9	54·1	22·1	2·9	0·1	84·2
Kymi.....	0·1	7·4	28·1	43·0	10·9	0·9	0·02	90·4
Total...	0·04	5·9	23·2	45·3	13·3	1·3	0·03	89·1

Previously Spawned Salmon.

Bothnian Bay Salmon.

Number

Years...	5	6	7	8	9	10	11	12	13	Total
Tornio (1930—35) ..	9	34	33	66	34	12	1	—	2	191
Kemi (1922—35) ...	9	42	139	293	72	38	7	3	—	603
Oulu (1922—35)....	11	36	91	138	47	29	5	1	—	360
Total...	29	112	263	497	153	79	13	4	2	1154

Per thousand

Tornio.....	1·5	5·5	5·3	10·7	5·5	1·9	0·2	—	0·4	30·8
Kemi.....	0·9	4·4	14·6	30·7	7·5	4·0	0·7	0·3	—	63·1
Oulu.....	1·4	4·5	11·3	17·2	5·8	3·6	0·6	0·1	—	44·7
Total...	1·2	4·7	11·1	20·9	6·4	3·3	0·5	0·2	0·1	48·5

Southern Finnish Salmon.

Number

Years...	4	5	6	7	8	9	10	11	Total
Kokemäki (1925—35).....	—	1	14	163	42	18	10	5	253
Kymi (1920—35).....	3	44	109	276	62	62	11	4	571
Total...	3	45	123	439	104	80	21	9	824

Per thousand

Kokemäki.....	—	0·6	8·7	101·6	26·2	11·2	6·2	3·1	157·6
Kymi.....	0·5	7·4	18·3	46·3	10·4	10·4	1·8	0·7	95·8
Total...	0·4	5·9	16·3	58·0	13·7	10·6	2·8	1·2	108·9

Table 21. **The Age-Groups of Salmon.**

Year	First time ascending: Total Age in years 3	4	5	6	7	8	9	Average Age	Total	Previously spawned: Total Age in years 5	6	7	8	9	10	11	12	Average Age	Total	Specimens
Tornio River.																				
1930	1	55	124	197	71	15	—	5·7	**463**	—	—	6	10	4	—	—	—	7·9	**20**	483
1931	9	67	370	457	74	16	1	5·6	**994**	—	1	2	15	13	7	—	—	8·6	**38**	1032
1932	—	167	90	135	78	7	—	5·3	**477**	2	3	1	7	8	—	—	—	7·8	**21**	498
1933	4	236	539	165	77	10	—	5·1	**1031**	3	6	4	10	—	1	—	—	7·0	**24**	1055
1934	3	161	744	1148	104	11	—	5·6	**2171**	4	19	9	20	8	4	—	—	7·5	**66**[1]	2237
1935	4	330	212	238	79	2	—	5·1	**865**	—	5	11	4	1	—	1	—	7·2	**22**	887
Total	21	1016	2079	2340	483	61	1	5·4	6001	9	34	33	66	34	12	1	—	7·6	191	6192
Percentage	0·3	16·4	33·6	37·8	7·8	1·0	0·02		96·9	0·15	0·55	0·53	1·07	0·55	0·19	0·02	—		3·08	
Kemi River.																				
1922	—	5	16	84	37	3	—	6·1	**145**	—	—	2	2	2	1	—	—	8·3	**7**	152
1923	—	1	27	14	16	—	1	5·8	**59**	—	—	1	9	1	—	—	—	8·0	**11**	70
1924	—	—	4	[illegible]	[illegible]	3	—	[illegible]	**66**	—	[illegible]		[illegible]					[illegible]	**9**	[illegible]
1925	6	49	89	82	103	23	1	5·8	**353**	—	2	13	37	10	8	1	—	8·2	**71**	424
1926	—	30	91	66	13	2	—	5·3	**202**	—	—	—	14	—	1	3	—	8·6	**18**	220
1927	1	12	59	87	5	—	—	5·5	**164**	—	—	2	1	3	—	1	—	8·6	**7**	171
1928	—	13	56	183	47	11	—	6·0	**310**	—	1	2	7	2	—	—	—	7·8	**12**	322
1929	—	5	53	317	152	18	—	6·2	**545**	—	2	7	25	5	3	—	—	8·0	**42**	587
1930	3	79	127	194	122	26	—	5·8	**551**	—	2	5	29	6	1	—	—	8·0	**43**	594
1931	4	9	59	95	23	3	1	5·7	**194**	—	1	1	7	5	1	—	1	8·5	**16**	210
1932	1	85	152	447	204	17	—	5·9	**906**	—	2	18	41	13	9	—	—	8·2	**83**	989
1933	—	33	941	384	95	9	—	5·4	**1462**	7	6	25	29	5	6	2	—	7·6	**80**	1542
1934	5	130	403	1703	123	9	—	5·8	**2373**	2	18	28	58	17	5	—	1	7·7	**129**	2502
1935	1	29	436	913	237	4	—	5·8	**1620**	—	7	35	26	3	3	—	1	7·5	**75**	1695
Total	21	480	2513	4615	1190	128	3	5·8	8950	9	42	139	293	72	38	7	3	7·9	603	9553
Percentage	0·2	5·0	26·3	48·3	12·5	1·4	0·03		93·7	0·09	0·44	1·46	3·07	0·75	0·40	0·07	0·03		6·31	
Oulu River.																				
1917	1	14	35	221	23	3	—	5·9	**297**	—	—	7	4	—	—	—	—	7·4	**11**	308
1918	—	8	11	[illegible]	16	—	—	[illegible]	**56**	—	—	4	6	—	—	—	—	[illegible]	**10**	[illegible]
1919	—	3	[illegible]	[illegible]	19	5	—	[illegible]	**86**	—	—	5	[illegible]	—	—	—	—	[illegible]	**6**	[illegible]
1920	2	16	11	17	6	—	—	5·2	**52**	—	—	—	—	—	—	—	—	—	—	52
1921	—	5	24	24	14	1	—	5·7	**68**	—	—	—	—	1	—	—	—	9·0	**1**	69
1922	—	1	3	15	5	—	—	6·0	**24**	—	—	—	—	—	1	—	—	10·0	**1**	25
1923	—	—	13	34	47	6	—	6·5	**100**	—	—	4	3	3	—	—	—	7·9	**10**	110
1924	—	—	2	31	26	8	—	6·6	**67**	—	—	—	3	3	—	—	—	8·3	**6**	73
1925	—	10	37	113	58	15	2	6·2	**235**	—	—	5	11	3	3	—	—	8·2	**22**	257
1926	1	5	93	87	38	6	2	5·8	**232**	1	—	1	8	7	8	2	—	8·9	**27**	259
1927	—	3	54	540	57	1	—	6·0	**655**	—	1	9	5	5	4	—	—	8·1	**24**	679
1928	—	14	45	213	104	6	—	6·1	**382**	1	1	6	4	—	—	—	—	7·1	**12**	394
1929	—	2	26	184	82	10	—	6·2	**304**	—	1	1	11	—	—	—	—	7·8	**13**	317
1930	—	10	113	184	140	15	1	6·1	**463**	—	—	1	5	2	—	—	—	8·1	**8**	471
1931	—	5	103	266	73	10	—	6·0	**457**	—	—	4	12	3	4	2	—	8·5	**25**	482
1932	—	23	123	558	168	15	1	6·0	**888**	—	9	11	9	4	2	1	—	7·5	**36**	924
1933	29	109	270	368	169	31	1	5·7	**977**	5	4	11	10	4	2	—	—	7·2	**37**[2]	1014
1934	31	153	183	778	164	18	1	5·7	**1328**	3	12	8	14	5	2	—	1	7·2	**46**[3]	1369
1935	4	62	336	474	128	14	—	5·7	**1019**[4]	1	8	16	30	7	3	—	—	7·7	**65**	1084
Total	68	443	1515	4158	1328	164	8	5·9	7685	11	36	91	138	47	29	5	1	7·8	360	8045
Percentage	0·9	5·5	18·8	51·7	16·5	2·0	0·1		95·5	0·14	0·45	1·13	1·72	0·58	0·36	0·06	0·01		4·47	

[1]) Also 2 ind. of 13 years [illegible] included in totals
[2]) Also one [illegible] included in totals
[3]) Also one [illegible] included in totals
[4]) Also one ten-year-old [illegible] included in totals

Table 21 (continued).

Area	First time ascending									Previously spawned									Total Specimens
	Total Age in years							Average Age	Total	Total Age in years							Average Age	Total	
	3	4	5	6	7	8	9			5	6	7	8	9	10	11	12			
Kokemäki River.																				
1925	1	8	121	81	1	—	—	5·3	**212**	—	5	13	1	1	—	—	—	6·9	**20**	232
1926	1	19	232	79	14	—	—	5·2	**345**	1	1	51	11	6	2	1	—	7·4	**73**	418
1927	—	3	91	34	4	—	—	5·3	**132**	—	2	42	16	3	—	—	—	7·3	**63**	195
1928	—	3	31	36	6	1	—	5·6	**77**	—	—	8	6	3	4	2	—	8·4	**23**	100
1929	—	5	37	23	9	—	—	5·5	**74**	—	—	15	2	3	1	—	—	7·5	**21**	95
1930	—	—	90	17	2	—	—	5·2	**109**	—	2	2	5	—	2	—	—	7·8	**11**	120
1931	—	6	3	8	3	—	—	5·4	**20**	—	1	6	—	—	—	1	—	7·4	**8**	28
1932	—	6	37	21	3	—	—	5·3	**67**	—	—	13	1	1	—	1	—	7·4	**16**	83
1934	—	9	121	23	2	—	—	5·1	**155**	—	1	4	—	1	1	—	—	7·6	**7**	162
1935	—	20	106	32	3	—	—	5·1	**161**	—	2	9	—	—	—	—	—	6·8	**11**	172
Total...	**2**	**79**	**869**	**354**	**47**	**1**	—	**5·3**	**1352**	**1**	**14**	**163**	**42**	**18**	**10**	**5**	—	**7·4**	**253**	**1605**
Percentage...	0·1	4·9	54·1	22·1	2·9	0·1	—		84·2	0·06	0·87	10·16	2·62	1·12	0·62	0·31	—		15·76	
Kymi River.																				
1920	1	20	100	97	8	—	—	4·4	**226**	—	3	3	1	3	2	—	—	6·8	**12**	238
1921	—	83	59	118	29	6	—	4·4	**295**	—	9	7	7	4	4	2	—	6·8	**33**	328
1922	—	1	77	72	32	1	—	4·8	**183**	—	—	16	22	4	2	—	—	6·8	**44**	227
1923	—	—	4	119	16	—	—	5·1	**139**	—	—	1	5	1	2	—	—	7·4	**9**	148
1924	—	2	8	67	30	1	—	5·2	**108**	—	2	15	14	3	2	—	—	6·7	**36**	144
1925	—	38	51	86	76	5	—	4·8	**256**	—	1	6	84	6	2	—	—	7·0	**99**	355
1926	1	98	409	122	39	1	1	4·2	**671**	2	6	3	19	13	6	1	—	7·1	**50**	721
1927	—	17	217	512	32	—	—	4·7	**778**	—	7	8	7	3	7	1	—	6·9	**33**	811
1928	—	15	123	315	92	6	—	4·9	**551**	1	5	11	14	4	6	1	1	7·0	**43**	594
1929	—	12	53	249	55	10	—	5·0	**379**	—	3	14	18	2	3	2	1	7·0	**43**	422
1930	—	15	22	110	86	5	—	5·2	**238**	—	1	4	13	3	1	—	—	7·0	**22**	260
1931	1	76	198	56	27	11	—	4·2	**369**	—	2	1	40	8	8	—	—	7·3	**59**	428
1932	—	38	284	217	17	2	—	4·4	**558**	—	3	—	10	4	10	3	—	7·9	**30**	588
1933	—	—	9	84	14	—	—	5·0	**107**	—	1	4	2	1	2	—	—	6·9	**10**	117
1934	—	8	33	221	31	2	—	5·0	**295**	—	—	13	3	—	4	1	1	7·1	**22**	317
1935	—	20	30	116	66	4	—	5·0	**236**	—	1	3	17	3	1	—	1	7·2	**26**	262
Total...	**3**	**443**	**1677**	**2561**	**650**	**54**	**1**	**4·7**	**5389**	**3**	**44**	**109**	**276**	**62**	**62**	**11**	**4**	**7·1**	**571**	**5960**
Percentage...	0·1	7·4	28·1	43·0	10·9	0·9	0·02		90·4	0·05	0·74	1·83	4·63	1·04	1·04	0·18	0·07		9·58	

The age of most salmon on their first ascent in the Bothnian Bay salmon area is 6 years; these represent 46·7% of the entire material for this area (including previously spawned individuals). In the southern Finland area, principally among those ascending the Kymi River, the majority — 45·3% — is formed by younger fish — 5 years old. I give these figures separately from my general survey.

6. Year-Classes.

Year-classes of individuals that have reached the right age for catching are the main factor for obtaining good catches of salmon. This, of course, is true of all fishing. Adverse weather conditions or other natural factors — excessive flooding of the rivers, for example — must affect fishing during the very best salmon seasons, while the inefficiency of the fishermen may prevent the proper utilisation of the facilities proffered. But these factors are only of secondary importance, as neither the utmost professional skill, nor the best possible weather conditions can create a good fishing season when the year-classes of the right age for catching do not form a sufficiently abundant stock owing to a weak or wasted renewal. In surveying matters from this point of view a good knowledge of conditions operating among the stock of salmon is a factor of major importance — at least I consider this to be the case in the future, in respect of those engaged in fishing as well as the fishery authorities, for example. For this reason, as mentioned earlier in this paper, I have endeavoured to shed light on conditions among the Baltic stock of salmon due to the varying individual abundance of the year-classes.

The division of the specimens in my material into the different year-classes is shown in Tables 22—26, in which the different river areas are separated. The combined result yielded by the material collected since 1925 is as follows (1925 was chosen as the starting point, as subsequent to that year every fish caught at the grounds from which material has been collected, has been examined, with very few, and thus insignificant, exceptions):—

Year-class:	Tornio	Kemi area	Oulu River	Total: Bothnian Bay	Kokemäki	Kymi	Total: Southern Finland
1917—18	—	214	127	**341**	32	437	**469**
1918—19	—	109	160	**269**	171	187	**358**
1919—20	—	186	202	**388**	260	151	**411**
1920—21	13	326	784	**1123**	294	244	**538**
1921—22	39	512	382	**933**	176	1113	**1289**
1922—23	117	544	405	**1066**	63	741	**804**
1923—24	292	354	332	**978**	70	543	**613**
1924—25	689	508	611	**1808**	121	224	**345**
1925—26	676	777	899	**2352**	24	112	**146**
1926—27	450	735	716	**1901**	49	459	**508**
1927—28	1975	3030	1224	**6229**	42	510	**552**
1928—29	1227	1359	778	**3364**	155	338	**493**
1929—30	377	566	523	**1466**	115	150	**265**
1930—31	333	34	93	**460**	20	38	**58**

A glance at the figures which indicate the number of salmon in different year-classes among the specimens collected from the Bothnian Bay shows that there are considerable divergencies between the representatives of the classes. The 1927—28 year-class occupies the first place in the material; salmon belonging to it amount to 6,229 specimens. It is followed by the 1928—29 year-class hatched during the next year and represented by 3,364 specimens.

The subsequent order of classes is as follows:—

Group A, represented by 1,800—2,300 specimens; year-classes 1924—25, 1925—26, and 1926—27, being the three year-classes that have preceded the abundant 1927—28 year-class;

Group B, represented by 900—1,500 specimens; 1920—21, 1921—22, 1922—23, 1923—24, and 1929—30.

Group C, represented by less than 500 specimens; 1917—18, 1918—19, 1919—20 and also probably the 1930—31 year-class, although the number of specimens in the latter rises slightly when 1936 specimens are taken into account.

It will be seen from the grouping of the different year-classes that they form periods as regards their individual abundance: the consecutive year-classes 1917—18, 1918—19 and 1919—20 represent periods when there were few individuals; the consecutive year-classes 1920—21, 1921—22, 1922—23 and 1923—24 represent a period of slightly increased individual abundance; the following year-classes 1924—25, 1925—26 and 1926—27 are abundant, and finally the 1927—28 and 1928—29 year classes, especially the former, comprise salmon seasons of great individual abundance.

Table 22. **Salmon Year-Classes: Tornio River.**

Year-Class	1930	1931	1932	1933	1924	1935	Total	1930	1931	1932	1933	1934	1935
	Number							Percentage					
1920—21	4	7	—	—	2	—	13	0·8	0·7	—	—	0·1	—
1921—22	25	14	—	—	—	—	39	5·2	1·3	—	—	—	—
1922—23	77	31	8	1	—	—	117	15·9	3·0	1·6	0·1		
1923—24	197	76	14	—	4	1	292	40·8	7·4	2·8	—	0·2	0·1
1924—25	124	458	79	20	8	—	689	25·7	44·4	15·9	1·9	0·4	—
1925—26	55	370	138	81	31	1	676	11·4	35·8	27·7	7·7	1·4	0·1
1926—27	1	67	92	171	113	6	450	0·2	6·5	18·5	16·2	5·0	0·7
1927—28	—	9	167	542	1167	90	1975	—	0·9	33·5	51·4	52·2	10·1
1928—29	—	—	—	236	748	243	1227	—	—	—	22·3	33·4	27·4
1929—30	—	—	—	4	161	212	377	—	—	—	0·4	7·2	23·9
1930—31	—	—	—	—	3	330	333	—	—	—	—	0·1	37·2
1931—32	—	—	—	—	—	4	4	—	—	—	—	—	0·5
1932—33	—	—	—	—	—	—	—	—	—	—	—	—	—
1933—34	—	—	—	—	—	—	—	—	—	—	—	—	—
1934—35	—	—	—	—	—	—	—	—	—	—	—	—	—
Total...	483	1032	498	1055	2237	887	6192	100	100	100	100	100	100

Table 23. **Salmon Year-Class**

Year-Class	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
					Number						
1911—12	1										
1912—13	2										
1913—14	5	2	—	1							
1914—15	39	9	—	8	3						
1915—16	84	17	11	11	1	1					
1916—17	16	14	13	60	—	—					
1917—18	5	27	47	116	16	3					
1918—19		1	4	84	13	1	2	3	—	1	
1919—20	—	—	—	89	66	7	18	5	1	—	
1920—21	—	—		49	91	87	49	43	6	1	
1921—22	—	—	—	6	30	59	184	159	55	6	10
1922—23		—	—	—	—	12	56	319	127	10	13
1923—24			—	—	—	1	13	53	196	24	57
1924—25				—	—	—	—	5	127	96	222
1925—26					—	—	—	—	79	59	449
1926—27						—	—	—	3	9	152
1927—28							—	—	—	4	85
1928—29								—	—	—	1
1929—30									—	—	—
1930—31										—	—
1931—32											—
1932—33											
1933—34											
1934—35											
Total...	**152**	**70**	**75**	**424**	**220**	**171**	**322**	**587**	**594**	**210**	**989**

The scale specimens collected from the salmon of southern Finland do not provide such a clear picture of the various periods. The Kokemäki River specimens are perhaps too restricted in quantity to be used as a basis for this type of survey, as salmon fishing in that river, as mentioned earlier, is on the decline. My material compiled from the Kymi River salmon has also been affected by certain exceptional conditions in 1933 and 1934. I have noted, for example, that 1934 was a particularly good salmon year also at the estuary of the Kymi River as in other parts of Finland (The two leading fish firms in the town of Kotka bought 20,000 kg. of salmon that year). This exception was not visible in the catches at the fishing grounds (Langinkoski and Rännikoski Rapids) in the Kymi River. In 1933 and 1934 the river above these rapids was dammed owing to building work, and the water was consequently low enough to hamper fishing.

According to scale specimens collected from the Kymi River, it would appear that the individual abundance or shortage of the year-classes does not correspond with the periods occurring in the Bothnian Bay area. According to the Kymi River specimens, 1921—22 was an abundant year-class and provided scale specimens of 1113 salmon. The second place is occupied by the following year-class, 1922—23, with 741 specimens. The subsequent order is 1923—24 (543 specimens), 1927—28 (510), 1926—27 (459), and 1917—18 (437 specimens). Taking into account my statements in connection with the Kymi River 1934-catch, the 1928—29 year-class should probably be included in this same group, although it is represented by 338 salmon only. The following year-classes have been weakly represented: 1918—19, 1919—20 and 1920—21 (represented by between 151 and 244 individuals), 1924—25 and 1925—26 (224 and 112 individuals), and 1929—30 (150 individuals).

I will interrupt my remarks on the varying individual abundance of the different year-classes, and will revert to the same question in another connection.

mi River.

1	1935	Total	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
							Percentage									
		1	0·7													
		2	1·3													
		8	3·3	2·9		0·2										
		59	25·6	12·8	—	1·9	1·4									
		125	55·3	24·3	14·7	2·6	0·4	0·6								
		103	19·5	20·0	17·3	14·2	—	—								
		214	3·3	38·6	62·7	27·4	7·3	1·7								
		109		1·4	5·3	19·8	5·9	0·6	0·6	0·5		0·5				
		186	—	—	—	21·0	30·0	4·1	5·6	0·9	0·2	—				
		326	—	—	—	11·6	11·4	20·0	15·2	7·3	1·0	0·5				
1		542	—	—	—	1·4	1·0	31·5	37·2	27·1	9·2	2·8	1·0	0·1	0·05	
	1	544	—	—	—	—	—	7·0	17·1	51·6	21·4	4·8	1·3	0·1	—	0·05
3	—	454	—	—	—	—	—	0·6	4·0	9·6	38·0	11·1	5·8	0·3	0·2	
7	5	508	—	—	—	—	—	—	—	0·3	21·4	45·7	22·5	2·5	0·7	0·2
7	3	777	—	—	—	—	—	—	—	—	13·5	28·1	45·4	7·8	2·7	0·2
1	30	735	—	—	—	—	—	—	—	—	0·5	1·3	15·4	25·3	6·0	1·8
1	272	**3030**	—	—	—	—	—	—	—	—	—	1·2	8·6	**61·5**	**68·8**	16·0
5	**920**	**1359**	—	—	—	—	—	—	—	—	—	—	0·1	2·1	16·2	**54·3**
0	436	566	—	—	—	—	—	—	—	—	—	—	—	—	5·2	25·7
5	29	34	—	—	—	—	—	—	—	—	—	—	—	—	0·2	1·7
	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	0·05
2	**1695**	**9553**	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 25. **Salmon Year-Classes: Kokemäki River.**

Year-Class	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
									Number													
1914—15 ...	—	1													1	—	0·2					
1915—16 ...	1	2													3	0·4	0·5					
1916—17 ...	1	6	—	2											9	0·4	1·4	—	2·0			
1917—18 ...	14	11	3	4											32	6·0	2·6	1·5	4·0			
1918—19 ...	86	65	16	3	1										171	37·1	15·6	8·2	3·0	1·0		
1919—20 ...	**121**	80	46	7	3	2	1								**260**	**52·2**	19·1	23·6	7·0	3·2	1·7	3·6
1920—21 ...	8	**233**	36	14	2	—	—	1							**294**	3·5	**55·8**	18·5	14·0	2·1	—	—
1921—22 ...	1	19	91	36	24	5	—	—							176	0·4	4·6	**46·7**	36·0	25·3	4·2	—
1922—23 ...		1	3	31	23	4	—	1							63	—	0·2	1·5	31·0	24·2	3·3	—
1923—24 ...	—	—	—	3	37	19	9	1	1						70	—	—	—	3·0	38·9	15·8	32·1
1924—25 ...	—	—	—	—	5	90	9	16	1						121	—	—	—	—	5·3	**75·0**	32·1
1925—26 ...	—	—	—	—	—	—	3	21	—						24	—	—	—	—	—	—	10·7
1926—27 ...	—	—	—	—	—	—	6	37	6						49	—	—	—	—	—	—	21·5
1927—28 ...	—	—	—	—	—	—	—	6	24	12					42	—	—	—	—	—	—	7·2
1928—29 ...	—	—	—	—	—	—	—	—	**121**	34					**155**	—	—	—	—	—	—	**74·7**
1929—30 ...	—	—	—	—	—	—	—	—	9	**106**					**115**	—	—	—	—	—	—	5·6
1930—31 ...	—	—	—	—	—	—	—	—	—	20					20	—	—	—	—	—	—	—
Total...	**232**	**418**	**195**	**100**	**95**	**120**	**28**	**83**	**162**	**172**	**1605**	100	100	100	100	100	100	100	100	100	100	100

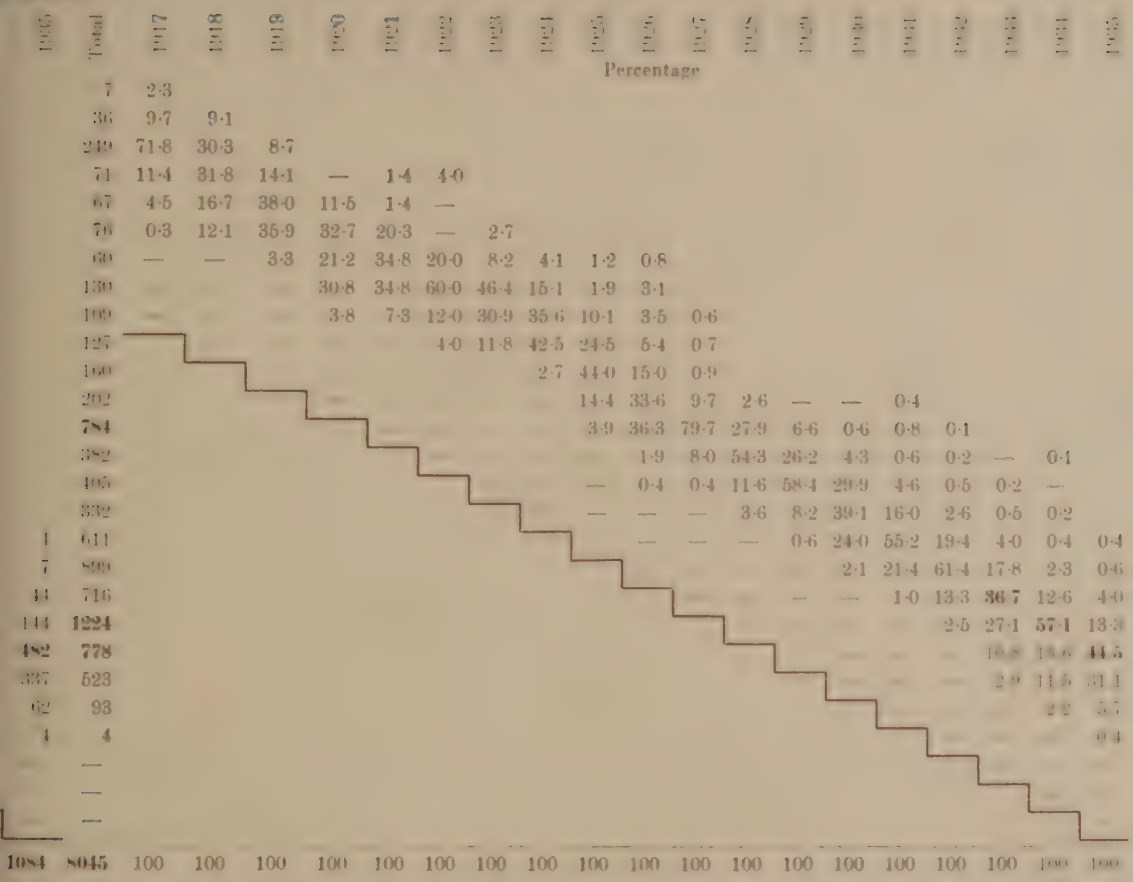
Table 24. **Salmon Year-Classe**

Number

Year-Class:	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
1908—09.....	7															
1909—10.....	30	6														
1910—11.....	221	20	8													
1911—12.....	35	21	13	—	1	1										
1912—13.....	14	11	35	6	1	—										
1913—14.....	1	8	33	17	14	—	3									
1914—15.....	—	—	3	11	24	5	9	3	3	2						
1915—16.....	—	—	—	16	24	15	51	11	5	8						
1916—17.....	—	—	—	2	5	3	34	26	26	9	4					
1917—18.....		—	—	—	—	1	13	31	63	14	5					
1918—19.....			—		—	—	—	2	113	39	6					
1919—20.....				—	—	—	—	—	37	87	66	10	—	—	2	
1920—21.....					—	—	—		10	94	541	110	21	3	4	1
1921—22.....						—	—	—	—	5	54	214	83	20	3	2
1922—23.....							—	—	—	1	3	46	185	141	22	5
1923—24.....								—	—	—	—	14	26	184	77	24
1924—25.....									—	—	—	—	2	113	266	179
1925—26.....										—	—		—	10	103	567
1926—27.....											—	—	—	—	5	123
1927—28.....												—	—	—	—	23
1928—29.....													—			
1929—30.....														—	—	—
1930—31.....																—
1931—32.....																—
1932—33.....																
1933—34.....																
1934—35.....																
Total...	**308**	**66**	**92**	**52**	**69**	**25**	**110**	**73**	**257**	**259**	**679**	**394**	**317**	**471**	**482**	**924**

In the above chapters I have endeavoured to illustrate the distribution of the salmon shoals in Finnish waters into different life-cycle classes during the period when I have taken measurements and weighings and collected scale specimens. In particular I would like to draw the attention of the reader to the figures which are obtained by combining all the observations of the years in question. This, in my opinion, will remove the particular fluctuations which are influenced by the different numbers of individuals in the year-classes if only a few years are taken into account. As my material in its entirety represents a fairly large number of salmon, I consider that my observations on the life-cycle classes will shed light on the normal course of life of the salmon stock in the Baltic as a whole.

a River.



Percentage

1916	Total	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
	7	2·3																			
	36	9·7	9·1																		
	249	71·8	30·3	8·7																	
	71	11·4	31·8	14·1	—	1·4	4·0														
	67	4·5	16·7	38·0	11·5	1·4	—														
	76	0·3	12·1	35·9	32·7	20·3	—	2·7													
	60	—	—	3·3	21·2	34·8	20·0	8·2	4·1	1·2	0·8										
	130				30·8	34·8	60·0	46·4	15·1	1·9	3·1										
	109				3·8	7·3	12·0	30·9	35·6	10·1	3·5	0·6									
	125						4·0	11·8	42·5	24·5	5·4	0·7									
	160								2·7	44·0	15·0	0·9									
	202									14·4	33·6	9·7	2·6	—	—	0·4					
	784									3·9	36·3	79·7	27·9	6·6	0·6	0·8	0·1				
	382										1·9	8·0	54·3	26·2	4·3	0·6	0·2	—	0·1		
	405									—	0·4	0·4	11·6	58·4	29·9	4·6	0·5	0·2	—		
	332									—	—	—	3·6	8·2	39·1	16·0	2·6	0·5	0·2		
1	611										—	—	—	0·6	24·0	55·2	19·4	4·0	0·4	0·4	
7	899														2·1	21·4	61·4	17·8	2·3	0·6	
44	716													—	—	1·0	13·3	**36·7**	12·6	4·0	
144	**1224**																2·5	27·1	**57·1**	13·3	
482	**778**																	16·8	13·6	**44·5**	
337	523																	2·9	11·5	31·1	
62	93																		2·2	5·7	
4	4																			0·4	
	—																				
	—																				
	—																				
1084	8045	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

III. Length and Weight of Salmon.

1. Length and Weight Measurements.

The results of measurings and weighings carried out at my specimen collecting stations are given below. Table 27 shows the average measurements and weights for the different salmon rivers (or areas) and different years in life-cycle classes. The number of weighings and measurings which form the basis for the average figures are also shown. Appendix A to Table 27, apart from giving the average measurements and weights, also shows the variations in the most important life-cycle classes among the specimens, the standard deviation and error (fluctuations of average). Appendix B shows the individuals in the grilse stage whose lengths are below the minimum of 50cm. suggested for salmon.

The average measurements and weights given in Table 27 clearly show that the average length and weight of salmon belonging to the same life-cycle class vary little with different years, i. e., they remain more or less unchanged. The table also shows that as regards their average length and weight the smolt-classes belonging to the same life-cycle group based on marine existence (e. g., 2.1+, 3.1+ and 4.1+ belong to the group A.1+) are so similar to one another that the differences caused by the variations in the smolt-age are hardly observeable. Furthermore the table shows that there is a fairly sharp distinction between the average lengths and weights of life-cycle groups such as A.1+, A.2+ and A.3+ resulting from varying duration of marine existence.

The length- and weight-classes are as follows:—

Group	Average Length	Average Weight
A.1+	53·4cm.	1·64kg
A.2+	79·6 -	5·83 -
A.3+	97·4 -	11·3 -
A.4+	112·6 -	16·1 -
A.5+	123·6 -	20·3 -

Table 26. **Salmon Year-Class**

Year-Class	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
						Number							
1910—11	2	2											
1911—12	3	4											
1912—13	1	4	2										
1913—14	11	13	4	2									
1914—15	100	36	23	1	2								
1915—16	100	127	48	5	3	2	1						
1916—17	20	59	72	17	15	6	6	1	1				
1917—18	1	83	77	119	45	89	14	7	1	1			
1918—19	—	—	1	4	69	82	20	3	6	2			
1919—20	—	—	—	—	8	87	42	7	4	3			
1920—21		—	—	—	2	51	128	40	20	2	1		
1921—22			—	—	—	38	**411**	**519**	103	28	3	8	3
1922—23				—	—	—	98	217	320	69	18	8	10
1923—24					—	—	1	17	124	252	90	51	4
1924—25						—	-	—	15	53	111	28	12
1925—26							—	—	—	12	22	58	17
1926—27								—	—	—	15	198	220
1927—28									—	·	—	76	284
1928—29										—	—	1	38
1929—30											—	—	—
1930—31												—	—
1931—32													—
1932—33													
1933—34													
1934—35													
Total...	**238**	**328**	**227**	**148**	**144**	**355**	**721**	**811**	**594**	**422**	**260**	**428**	**588**

2. Certain Weight-Class Statistics.

At the outset of the investigations, it appeared that there was very little hope of obtaining scale specimens from any large number of salmon, and I did not know how to carry out the work on age determinations even if the collection of scale specimens should be extensive. Under these circumstances I assumed that the catch statistics, divided into weight-classes, might perhaps provide a suitable basis for determining the different year-classes, of individual abundance, if the figures obtained from the statistics were converted along the lines suggested by scale investigations. Table 28 gives the original statistics and Table 29 is an attempt to convert weight-classes into probable age-groups.

The statistics given in Table 28 embrace the data obtained from the fishing grounds mentioned in the appendix to Tables 3 and 4, grouped as in the tables.

In considering the weight-classes I had to rely, more or less, on estimates; the data on lengths and weights shown in Table 27 were not then available. The division is as follows: first group: fish below 3 kg. (grilse), second group: 3·5—7 kg. (small salmon), third: 7·5—13 kg.; fourth: 13·5—19 kg., and fifth: (and last group): salmon weighing above 19 kg.

As is usual with statistics, particular attention must be paid to the original sources of information, although in several cases this is difficult to control with sufficient exactitude. With regard to later statements based on these statistics, I very much doubt whether sufficient care was devoted in compiling the original data to following the medium, and at the same time to the most important life-cycle classes; a certain amount of generalisation has been necessary, particularly in areas (such as the Simo) where the number of fish was so large that even the sorting was a race against time. From personal experience I know that our fishermen usually just divide the salmon up into "big" and "small" when the catch is brought to the bank, and then weigh the two groups as a whole with a decimal balance after the salmon have been counted. As far as I have noticed, the division into "big" and "small" has been done from a commercial, more than a statistical, point of view. I am compelled to make

River.

1935	Total	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
								Percentage									
	4	0·9	0·6														
	7	1·3	1·2														
	7	0·4	1·2	0·9													
	30	4·6	4·0	1·8	1·3												
	162	42·0	11·0	10·1	0·7	1·4											
	286	42·0	38·7	21·2	3·4	2·1	0·5	0·1									
	197	8·4	18·0	31·7	11·5	10·4	1·7	0·8	0·1	0·2							
	437	0·4	25·8	35·9	80·4	31·2	25·1	2·0	0·9	0·2	0·2						
	187	—	—	0·4	2·7	47·9	23·1	2·8	0·4	1·0	0·5						
	151					5·6	24·5	5·8	0·2	0·6	0·7						
	244					1·4	14·4	17·8	4·9	3·4	0·5	0·1					
	1113						10·7	**57·0**	**64·0**	17·3	6·6	1·1	1·9	0·3			
	741							13·6	26·7	53·9	16·4	6·9	1·9	1·7	—	0·3	
1	543							0·1	2·1	20·9	59·7	34·6	11·9	0·7	1·7	0·3	0·4
—	224									2·5	12·6	12·7	6·5	2·0	0·9	1·3	
1	112							—	—	—	2·8	8·5	13·5	2·9	1·7	—	0·4
3	459											5·8	16·3	37·1	15·1	1·6	1·1
21	510										—	—	17·8	48·3	72·6	13·9	8·0
69	338										—	—	0·2	6·6	7·7	69·7	26·3
117	150															10·1	44·7
30	38															2·5	11·5
20	20															—	7·6
—	—																
—	—																
—	—																
262	**5960**	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

the above observation partly owing to the fact that I do not consider that I have succeeded in dividing the catch statistics into weight-classes to such extent as intended, and also because the (relative) proportion of small salmon (3·5—7 kg) in the statistics from the Simo area in particular, has been considerably higher than in the statistics for neighbouring areas on several occasions (1926, 1929, 1931, 1933—35). On the other hand, the information from the Simo area in Table 27 — owing to the number of salmon obtained — dominates the entire statistics on catches from the Bothnian Bay. In this connection I particularly regret the fact that I did not try to find a suitable person to make scale collections at the more important fishing grounds in the Simo area at a sufficiently early date, and that I was finally unsuccessful in this. Otherwise I should now have had an opportunity to check the Simo area statistics in the light of scale analysis.

The different weight-classes of the salmon, in so far as the divisions have been made correctly, show the length of sea life only of individuals ascending for the first time. In order to determine the age-groups and year classes from the weight classes it would be essential to know the length of the smolt-age also. It would further be necessary to exclude the previously spawned salmon from the weight-classes — particularly the higher ones. Unfortunately both of these unknown factors are of varying value. The number of previously spawned salmon among the shoals in the Bothnian Bay nevertheless is fairly small — averaging 4·9—5%, — whereas the number of these fish among salmon which have recently ascended the southern Finnish salmon rivers (particularly the Kokemäki River) has been fairly high.

In converting the figures of salmon from weight-classes into "age-groups" I have perhaps employed too simple and general a method. I have, namely, employed the division according to smolt-ages which forms the mean when all my investigations concerning the area in question are combined. It would have been

(Cont. page 76.)

Table 27. **Mean Length and Weight of Salmon.**

Age before ascending	Life-Cycle Classes and Years	Mean Length, in cm.							Mean Weight, in kg.							Number of Individuals					
		Tornio		Kemi	Oulu	Koke-mäki	Kymi		Tornio		Kemi	Oulu	Koke-mäki	Kymi		Tornio		Kemi	Oulu	Koke-mäki	Kymi	
3—5	A.1+	4.1+	3.1+	3.1+	3.1+	2.1+	2.1+	3.1+	4.1+	3.1+	3.1+	3.1+	2.1+	2.1+	3.1+	4.1+	3.1+	3.1+	3.1+	2.1+	2.1+	
	1920	—	—	—	57·4	—	55·9	—	—	—	—	2·20	—	2·10	—	—	—	—	16	—	20	
	1921	—	—	—	—	—	55·3	—	—	—	—	—	—	1·99	—	—	—	—	—	—	81	
	1925	—	—	54·4	—	60·0	56·4	—	—	—	1·73	—	2·00	2·17	—	—	—	37	—	1	37	
	1926	—	—	55·0	—	55·0	53·2	54·7	—	—	1·87	—	2·00	1·65	1·72	—	—	24	—	1	98	1
	1927	—	—	55·7	—	—	53·4	57·1	—	—	1·81	—	—	1·81	1·89	—	—	8	—	—	17	
	1928	—	—	59·3	60·4	—	56·0	60·8	—	—	2·00	2·30	—	1·96	2·40	—	—	9	8	—	15	
	1929	—	—	—	—	—	55·9	—	—	—	—	—	—	1·90	—	—	—	—	—	—	12	
	1930	54·3	52·2	57·9	—	—	55·5	58·5	1·70	1·52	1·84	—	—	2·07	2·05	41	55	73	—	—	15	
	1931	56·7	56·0	—	—	—	57·9	60·4	1·99	1·99	—	—	—	2·18	2·48	35	65	—	—	—	76	1
	1932	52·7	50·0	56·2	—	—	54·6	54·5	1·50	1·43	1·84	—	—	1·85	1·35	26	163	35	—	—	36	
	1933	51·6	51·0	53·7	54·1	—	—	—	1·38	1·33	1·40	1·59	—	—	—	188	236	3	96	—	—	
	1934	51·6	51·1	51·8	57·1	—	53·3	46·0	1·45	1·42	1·51	1·91	—	1·60	1·10	159	149	110	115	—	8	
	1935	53·8	52·4	55·8	59·0	—	58·5	54·5	1·69	1·51	2·01	2·21	—	2·18	1·55	46	328	14	21	—	20	
Total Mean		**52·4**	**51·7**	**54·8**	**56·0**	**57·5**	**55·4**	**56·9**	**1·51**	**1·47**	**1·72**	**1·84**	**2·00**	**1·95**	**1·98**	**495**	**996**	**313**	**256**	**2**	**435**	**4**
Total Mean Result ..								**53·4**							**1·64**							
4—6	A.2+	4.2+	3.2+	3.2+	3.2+	2.2+	2.2+	3.2+	4.2+	3.2+	3.2+	3.2+	2.2+	2.2+	3.2+	4.2+	3.2+	3.2+	3.2+	2.2+	2.2+	
	1917	—	—	—	78·4	—	—	—	—	—	—	5·36	—	—	—	—	—	—	14	—	—	
	1919	—	—	—	87·3	—	—	—	—	—	—	6·59	—	—	—	—	—	—	27	—	—	
	1920	—	—	—	80·7	—	76·8	76·7	—	—	—	6·50	—	5·74	5·68	—	—	—	6	—	90	1
	1921	—	—	—	77·1	—	76·7	80·7	—	—	—	7·40	—	5·53	5·95	—	—	—	20	—	56	2
	1922	—	—	80·0	—	—	76·5	72·0	—	—	5·41	—	—	5·22	4·13	—	—	11	—	—	73	
	1923	—	—	81·7	—	—	69·3	—	—	—	5·23	—	—	5·00	—	—	—	11	—	—	3	
	1924	—	—	—	—	—	73·0	—	—	—	—	—	—	4·50	—	—	—	—	—	—	8	
	1925	—	—	80·8	85·9	75·8	76·8	78·9	—	—	6·42	7·08	5·50	5·33	5·42	—	—	76	24	8	46	1
	1926	—	—	79·9	85·5	75·9	73·3	75·9	—	—	5·75	7·00	5·79	4·63	5·21	—	—	84	58	17	396	2
	1927	—	—	80·9	85·7	74·3	74·6	74·0	—	—	6·01	7·09	4·66	4·61	4·39	—	—	53	22	3	207	3
	1928	—	—	81·1	85·1	73·0	73·2	75·9	—	—	5·40	6·68	4·33	4·46	4·93	—	—	50	30	3	111	1
	1929	—	—	77·9	84·8	75·4	75·2	76·2	—	—	5·09	6·91	5·80	5·05	5·20	—	—	34	11	5	51	1
	1930	76·6	77·9	79·4	84·6	—	79·2	77·3	4·92	5·42	5·52	6·97	—	5·90	5·95	59	80	90	53	—	20	
	1931	82·3	81·3	84·7	84·6	76·8	76·8	77·1	6·30	6·07	7·22	7·07	5·20	5·40	5·25	250	331	58	87	5	185	1
	1932	81·2	80·2	84·9	89·0	79·7	78·2	79·8	6·26	6·26	6·91	8·03	6·00	5·61	5·94	56	61	120	77	6	282	4
	1933	79·5	77·2	83·4	89·0	—	78·5	80·0	5·62	5·20	6·43	7·75	—	5·47	5·90	68	337	707	105	—	8	
	1934	79·3	78·3	80·1	86·5	73·9	75·1	79·0	5·88	5·47	5·87	7·29	4·83	4·97	5·58	346	570	316	63	9	30	1
	1935	79·6	78·0	79·1	86·2	73·4	75·7	79·4	5·63	5·59	5·81	7·06	5·25	5·09	5·10	49	151	292	161	20	28	
Total Mean		**80·2**	**78·7**	**81·6**	**86·1**	**75·1**	**75·3**	**77·4**	**5·93**	**5·58**	**6·15**	**7·20**	**5·38**	**5·07**	**5·36**	**828**	**1530**	**1902**	**758**	**76**	**1594**	**23**
Total Mean Result ..								**79·6**							**5·83**							

Table 27 (continued).

[illegible]	Mean Length, in cm.							Mean Weight, in kg.							Number of Individuals						
	Tornio		Kemi	Oulu	Kokemäki	Kymi		Tornio		Kemi	Oulu	Kokemäki	Kymi		Tornio		Kemi	Oulu	Kokemäki	Kymi	
A 3	4.3	3.3	3.3	3.3	2.3	2.3	3.3	4.3	3.3	3.3	3.3	2.3	2.3	3.3	4.3	3.3	3.3	3.3	2.3	2.3	3.3
1917	—	—	—	101·6	—			—			11·4							216	—	—	—
1918	—	—	—	104·4	—	—	—	—	—	—	10·6	—	—	—	—	—	—	20	—	—	—
1919	—	—	—	100·0							10·6							20			
1920	—	—	—	104·2	—	91·2	91·6	—	—	—	13·5	—	9·4	9·6	—		—	16	—	[illegible]	7
1921	—	—	—	103·5	—	98·7	99·0	—	—	—	11·9	—	11·3	12·2	—		—	17		[illegible]	18
1922	—	—	103·0	103·6	—	92·2	101·8	—	—	13·1	12·1	—	9·4	11·1	—	—	[illegible]	15	—	[illegible]	27
1923	—	—	102·5	101·7	—	90·7	99·0	—	—	10·6	11·5	—	8·9	11·4	—	—	[illegible]	28	—	[illegible]	7
1924	—	—	98·9	103·5	—	86·1	94·3	—	—	11·3	11·8	—	7·6	9·8	—		[illegible]	22		66	4
1925	—	—	100·2	102·5	94·7	91·3	93·1	—	—	12·3	12·1	10·2	9·0	9·1	—	—	[illegible]	[illegible]	[illegible]	[illegible]	22
1926	—	—	101·2	102·7	94·2	93·1	93·5	—	—	12·1	12·0	10·1	9·5	9·7	—		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1927	—	—	99·6	103·4	92·5	91·5	95·7	—	—	11·6	12·3	9·7	8·7	9·6	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1928	—	—	100·0	103·7	94·0	91·1	92·8	—	—	9·4	11·8	10·0	8·6	9·1	—		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1929	—	—	97·6	100·5	94·1	91·2	93·1	—	—	10·2	11·4	9·8	8·8	9·0	—		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1930	99·7	97·5	98·5	103·6	94·4	94·5	94·9	11·6	11·1	11·3	12·4	10·5	9·9	10·3	24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1931	97·5	99·4	99·7	102·3	97·0	94·8	95·1	10·7	11·7	11·2	11·8	10·5	10·0	9·9	31	[illegible]	81	[illegible]	2	41	[illegible]
1932	101·7	100·8	103·2	104·4	97·9	95·5	95·5	12·5	12·5	12·2	12·4	11·3	10·3	9·9	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1933	101·8	101·0	103·0	104·6	—	98·0	101·1	13·2	12·4	12·4	12·8	—	11·1	12·2	57	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
1934	99·2	99·9	82·3	105·0	92·6	94·9	100·2	11·8	12·3	11·3	13·0	10·8	10·2	11·9	73	[illegible]	[illegible]	747	[illegible]	[illegible]	9
1935	101·8	100·2	99·6	104·7	93·9	95·4	97·3	12·9	12·3	11·4	12·8	10·7	10·5	10·9	67	[illegible]	[illegible]	442	[illegible]	111	33
Total Mean	**100·6**	**99·8**	**98·8**	**103·8**	**94·0**	**92·8**	**95·9**	**12·8**	**12·1**	**11·4**	**12·4**	**10·8**	**9·4**	**10·1**	**812**	**1439**	**4112**	**3889**	**838**	**2323**	**297**
Total Mean result							**97·4**							**11·8**							
A 4	4.4	3.4	3.4	3.4	2.4	2.4	3.4	4.4	3.4	3.4	3.4	2.4	2.4	3.4	4.4	3.4	3.4	3.4	2.4	2.4	3.4
1917				116·3							17·4							15			
1918		—	—	119·9	—			—	—	—	15·7				—	—	—	13	—		—
1919				115·4							16·2							9			
1920			—	107·5	—	—	—	—	—	—	16·5	—	—	—	—	—	—	2	—	—	—
1921	—	—	—	121·0	—	112·1	115·5	—	—	—	16·5	—	16·3	18·7	—	—	—	4	—	10	6
1922	—	—	111·4	118·7	—	111·4	—	—	—	16·8	18·8	—	16·2	—	—		8	3	—	5	—
1923	—	—	118·5	114·4	—	106·9	—	—	—	16·4	15·8	—	13·8	—	—		12	36		9	
1924	—	—	110·2	114·3	—	107·0	—	—	—	15·1	15·6	—	13·9	—	—		13	24		26	—
1925	—	—	111·3	115·6	106·2	104·5	105·6	—	—	16·5	17·2	14·2	13·3	12·4	—	—	90	54	50	54	5
1926	—	—	114·6	115·6	111·2	108·3	—	—	—	17·4	17·3	16·0	14·7	—	—	—	11	33	65	20	—
1927	—	—	119·4	115·3	109·8	110·3	—	—	—	19·6	17·4	15·9	14·6	—	—	—	3	34	22	12	—
1928	—	—	112·1	113·7	107·1	106·5	112·4	—	—	15·2	15·7	13·4	13·5	15·6	—		45	86	23	47	5
1929	—	—	112·6	113·3	106·1	106·4	104·4	—	—	15·7	16·0	14·5	13·6	12·7	—	—	108	64	11	44	9
1930	106·0	109·6	111·1	113·1	109·2	108·8	107·6	13·7	15·1	15·3	16·3	15·0	14·1	13·4	11	14	105	126	11	48	5
1931	114·2	114·5	110·6	115·7	115·4	110·6	109·3	17·4	17·5	16·1	16·7	17·1	14·9	14·3	7	10	16	67	7	13	9
1932	110·4	113·0	113·9	117·9	114·0	113·8	—	16·2	17·6	16·7	17·1	16·8	16·6	—	5	18	35	51	2	6	—
1933	115·4	117·4	117·1	117·1	—	114·5	—	17·1	19·2	18·5	17·9	—	15·9	—	7	20	32	62	—	2	—
1934	117·3	114·3	113·1	115·6	111·0	112·8	117·0	18·7	17·3	16·3	17·3	16·3	16·3	17·4	7	16	41	97	11	22	1
1935	117·0	114·0	114·2	117·6	110·6	112·1	113·8	19·0	18·0	17·2	17·9	17·2	16·3	16·6	1	9	46	93	18	32	4
Total Mean	**112·2**	**113·2**	**112·6**	**115·3**	**109·2**	**108·2**	**109·5**	**16·4**	**17·0**	**16·2**	**16·8**	**15·8**	**14·2**	**14·7**	**88**	**147**	**565**	**873**	**220**	**350**	**44**
Total Mean result							**112·6**							**16·1**							

Table 27 (continued).

Age before ascending	Life-Cycle Classes and Years	Mean Length, in cm.						Mean Weight, in kg.						Number of Individuals					
		Tornio		Kemi	Oulu	Koke-mäki	Kymi	Tornio		Kemi	Oulu	Koke-mäki	Kymi	Tornio		Kemi	Oulu	Koke-mäki	Kymi
7– 9	A.5	4.5	3.5	3.5	3.5	2.5	2.5	4.5	3.5	3.5	3.5	2.5	2.5	4.5	3.5	3.5	3.5	2.5	2.5
	1919	—	—	—	113·5	—	—	—		—	16·5	—	—	—	—	—	2	—	—
	1924	—	—	—	125·5	—	—	—		—	18·5	—	—	—	—	—	2	—	—
	1925	—	—	121·0	127·2	—	—	—		20·3	22·1	—	—	—	—	21	13	—	—
	1926	—	—	—	125·3	122·5	—	111·0	—	—	20·7	19·5	—	16·5	—	—	3	2	—
	1927	—	—	—	—	117·5	—	—	—		—	19·0	—	—	—	—	—	2	—
	1928	—	—	121·3	125·5	—	120·0	—	—		18·3	19·8	—	19·0	—	—	10	2	—	1
	1920	—	—	123·1	126·5	—	123·0	—			19·7	18·5	—	19·2	—	—	10	2	—	1
	1930	—	114·3	120·9	126·9	—	—	—		16·5	18·8	21·7	—	—	—	4	13	7	—	—
	1931	—	119·4	—	122·3	—	118·5	—	—	18·4	—	18·8	—	18·1	—	—	8	—	3	—	2
	1932	—	127·0	124·0	128·7	—	—	—	—	24·3	22·2	21·5	—	—	—	—	2	4	3	—	—
	1933	—	123·0	124·5	127·5	—	—	—	—	25·0	20·5	23·8	—	—	—	—	1	2	11	—	—
	1934	—	128·5	120·7	124·8	115·0	118·0	—	—	21·3	20·2	21·5	23·0	21·2	—	—	4	3	4	1	1
	1935	—	123·0	—	124·0	120·0	—	—	—	21·8	—	20·9	18·0	—	—	—	1	—	9	2	—
Total Mean			**121·3**	**121·6**	**125·7**	**119·3**	**119·6**	**111·0**	—	**19·7**	**19·7**	**21·4**	**19·4**	**19·1**	**16·5**	—	**20**	**63**	**61**	**7**	**5**
Total Mean Result ..								**123·6**							**20·3**						

better, of course, to apply the relative figures obtained from scale specimens to the catch statistics of the same year from the same area. The calculation would have been more complicated, but the results might have been more accurate. I have thus made the "conversion" from weight-classes by dividing [in percentage] the number of individuals in each weight-class into different smolt-age-groups, according to their average figures, as shown on page 35. As regards the Tornio area, for example, I have applied the following ratios: 2% — two-year smolt-age, 68% three-year, and 30% four or five-year smolt-age. Each weight-class is therefore divided into three different age-groups of varying size the youngest of which is combined with the remaining individuals of the lower, and the oldest with those of the upper, weight-class. At the same time I have estimated the number of any possible re-ascending salmon among the weight-classes according to the percentage which, as an average peculiar to the salmon of the area, is given on page 47. In other calculations I have not taken any possible re-ascending salmon into consideration, as they have been a fraction only of the salmon on their first ascent. As a result of the first-mentioned method of calculation in regard to the number of re-ascending salmon, the number is over-estimated during years of large catches, which in turn needlessly increases the number of older age-groups, while during years of bad catches the number of individuals is too low, the number of individuals in the weaker age-groups being increased owing to the scarcity of salmon to be transferred. This method of calculation, therefore, has a stabilising effect on the numbers in the various year-classes by increasing the year-classes of few individuals and decreasing abundant ones.

The "probable" converting of salmon belonging to the various weight-classes into age-groups by the method described above is shown in detail in the appendix to Table 29. The results given in the table do not tempt me to make new calculations by employing the figures on smolt-ages and previously spawned individuals which I have obtained from scale specimens collected during the corresponding years, instead of utilising the method based on averages. By doing so it is probable that certain variable phenomena would have been more closely observed. (I should have carried out this work, of course, if the original sources of information had been absolutely accurate and reliable.)

Confirmation as to the result of the conversion of the catch statistics into weight-classes has been provided by the fact that since 1926 the catch statistics from the Kymi, Kokemäki and Oulu Rivers, and the Tornio area in particular, generally consist of the identical fish that have provided the scale specimen material for my age definitions. I am thus able to compare the results yielded by the scale analysis with those derived from the conversion of the statistics in question.

(Cont. page 80.)

Table 27, Appendix A.

Means and Standard Deviations of the Principal Size-Measurements.

Tornio River: Kiviranta.

	Year	Ind.	Mean		Stand. Dev.	
3.4	1930.....	30	109·43	± 0·8966	± 4·9106	
	1931.....	33	114·27	± 0·8274	± 4·7533	
4.3	1931.....	25	98·20	± 0·9448	± 4·7244	
	1932.....	22 ♂	102·41	± 1·4988	± 7·0301	
		31 ♀	100·03	± 1·0206	± 5·6824	
	1933.....	31	102·00	± 0·9327	± 5·1930	
	1934.....	29 ♂	102·19	± 1·4789	± 6·9295	
		44 ♀	97·64	± 0·8406	± 5·5759	
	1935.....	21 ♂	105·33	± 1·0697	± 4·9024	
		34 ♀	98·32	± 0·7068	± 4·1214	
3.3	1930.....	100	97·72	± 0·4854	± 4·8545	
	1931.....	171	99·34	± 0·4245	± 5·5516	
	1932.....	66	100·17	± 0·7554	± 6·1373	
	1933.....	20 ♂	102·75	± 1·1487	± 5·1369	
		38 ♀	99·37	± 0·9225	± 5·6865	
	1934.....	228 ♂	102·70	± 0·3779	± 5·7068	
		445 ♀	97·81	± 0·2504	± 5·2693	
	1935.....	60 ♂	103·18	± 0·7640	± 5·9176	
		103 ♀	98·22	± 0·4466	± 4·5325	
4.2	1930.....	38	77·18	± 0·7479	± 4·6105	
	1931.....	233	82·24	± 0·3004	± 4·5852	
	1932.....	45	80·16	± 1·0650	± 7·1471	
	1933.....	48	78·94	± 0·8510	± 5·8959	
	1934.....	70 ♂	80·59	± 0·7060	± 5·9096	
		226 ♀	78·62	± 0·3886	± 5·7765	
	1935.....	42	79·50	± 1·1000	± 7·1289	
3.2	1930.....	62	78·39	± 0·6497	± 5·1157	
	1931.....	306	81·39	± 0·2680	± 4·6885	
	1932.....	45	79·49	± 1·0393	± 6·9717	
	1933.....	42 ♂	78·83	± 1·2111	± 7·8489	
		102 ♀	79·36	± 0·5531	± 7·0396	
	1934.....	149 ♂	79·13	± 0·4387	± 5·3548	
		342 ♀	77·42	± 0·2847	± 5·2659	
	1935.....	37 ♂	78·62	± 1·0887	± 6·6226	
		87 ♀	77·24	± 0·6156	± 5·7420	
5.1	1934.....	40	50·48	± 0·8161	± 5·1618	
4.1	1930.....	28	54·36	± 0·6231	± 3·2970	
	1931.....	30	56·67	± 0·8580	± 4·6994	
	1932.....	20	53·50	± 1·3182	± 5·8949	
	1933.....	54 ♂	52·74	± 0·5948	± 4·3699	
		23 ♀	51·39	± 0·7499	± 3·5965	
	1934.....	47 ♂	53·17	± 0·7123	± 4·8830	
		61 ♀	51·41	± 0·6376	± 4·9799	
	1935.....	33	53·27	± 0·7339	± 4·2161	
3.1	1930.....	49	52·14	± 0·5061	± 3·5429	
	1931.....	60	56·42	± 0·6152	± 4·7652	
	1932.....	65 ♂	50·85	± 0·6772	± 5·4604	
		52 ♀	49·79	± 0·6757	± 4·8725	
	1933.....	57 ♂	52·58	± 0·4224	± 3·1894	
		30 ♀	52·13	± 0·6142	± 3·3640	
	1934.....	56 ♂	52·14	± 0·4707	± 3·5226	
		41 ♀	50·66	± 0·8210	± 5·2571	
	1935.....	139 ♂	53·17	± 0·3228	± 3·8055	
		107 ♀	51·07	± 0·3550	± 3·6717	

Tornio River: Sumisaari.

	Year	Ind.	Mean		Stand. Dev.	
4.3	1933.....	26	101·54	± 1·3158	± 6·7094	
3.3	1930.....	31	96·84	± 1·0323	± 5·7477	
	1931.....	36	99·50	± 1·3897	± 8·3383	
	1932.....	29	101·90	± 1·1947	± 6·4340	
	1934.....	26 ♂	104·81	± 1·3889	± 7·0818	
		45 ♀	102·42	± 0·8407	± 5·6393	
	1935.....	23	101·13	± 1·9724	± 9·4636	
4.2+	1930.....	21	75·67	± 1·0781	± 4·9405	
	1933.....	20	80·90	± 1·2661	± 5·6632	
	1934.....	34	81·50	± 1·0598	± 6·1799	
3.2+	1931.....	25	80·28	± 1·2477	± 6·2387	
	1933.....	63 ♂	80·00	± 0·9970	± 7·9142	
		70 ♀	76·10	± 0·8500	± 7·1120	
	1934.....	71	80·93	± 0·6495	± 5·4728	
	1935.....	27	79·52	± 1·5048	± 7·8200	
4.1+	1933.....	108	51·03	± 0·4552	± 4·7306	
	1934.....	30	50·90	± 0·8542	± 4·6787	
3.1+	1932.....	23	51·87	± 1·1590	± 5·5584	
	1933.....	137	49·98	± 0·3837	± 4·4912	
	1934.....	36	50·89	± 0·7090	± 4·2540	
	1935.....	39 ♂	52·49	± 0·7509	± 4·6894	
		43 ♀	53·05	± 0·6914	± 4·5338	

Kemi River.

	Year	Ind.	Mean		Stand. Dev.	
3.5	1925.....	21	121·00	± 0·9851	± 4·5145	
3.4	1925.....	60 ♂	113·75	± 0·4712	± 3·6498	
		30 ♀	106·50	± 0·9150	± 5·0117	
	1928.....	45	112·10	± 0·6200	± 4·1593	
	1929.....	78 ♂	115·23	± 0·5102	± 4·5062	
		26 ♀	108·50	± 0·9251	± 4·7170	
	1930.....	65 ♂	113·48	± 0·5172	± 4·1695	
		40 ♀	107·28	± 0·7432	± 4·7007	
	1932.....	45	113·93	± 0·7014	± 4·7048	
	1933.....	32	117·07	± 0·9056	± 5·1230	
	1934.....	41	113·10	± 0·6192	± 3·9651	
	1935.....	46	114·20	± 0·6825	± 4·6278	
4.3	1922.....	29	103·43	± 0·8098	± 4·3614	
	1929.....	44	96·25	± 0·8583	± 5·6934	
	1932.....	60 ♂	105·92	± 0·6046	± 4·6837	
		107 ♀	99·90	± 0·5380	± 5·5655	
	1933.....	61	101·70	± 0·8923	± 6·9696	

Table 27, Appendix A (continued).

	Year	Ind.	Mean		Stand. Dev.
	1934.....	78	98·86	± 0·6411	± 5·6628
	1935.....	60 ♂	103·09	± 0·7127	± 5·5204
		127 ♀	97·51	± 0·4593	± 5·1764
3.3	1915.....	26	102·81	± 1·1754	± 5·9934
	1922.....	22 ♂	108·55	± 0·8969	± 4·2068
		57 ♀	100·82	± 0·6332	± 4·7806
	1924.....	30	98·93	± 0·9369	± 5·1318
	1925.....	21 ♂	102·71	± 0·9360	± 4·2896
		56 ♀	99·21	± 0·4494	± 3·3635
	1926.....	55	101·18	± 0·6123	± 4·5412
	1927.....	81	99·61	± 0·4925	± 4·4331
	1928.....	57 ♂	101·51	± 1·0992	± 8·2994
		121 ♀	99·24	± 0·3469	± 3·8160
	1929.....	307	97·62	± 0·2575	± 4·5124
	1930.....	36 ♂	103·69	± 0·5891	± 3·5350
		134 ♀	97·16	± 0·2644	± 3·0610
	1931.....	29 ♂	102·17	± 1·0662	± 5·7420
		52 ♀	98·27	± 0·6232	± 4·4940
	1932.....	104 ♂	107·38	± 0·4669	± 4·7616
		294 ♀	101·70	± 0·2702	± 4·6339
	1933.....	67 ♂	106·43	± 0·7678	± 6·2850
		232 ♀	102·03	± 0·3673	± 5·5955
	1934.....	407 ♂	103·86	± 0·2652	± 5·3504
		1106 ♀	98·56	± 0·1583	± 5·2677
	1935.....	212 ♂	103·96	± 0·3567	± 5·1942
		619 ♀	98·08	± 0·1855	± 4·6140
2.3	1932.....	24	99·63	± 1·0387	± 5·0887
	1933.....	61 ♂	106·03	± 0·7463	± 5·8295
		166 ♀	102·83	± 0·3644	± 4·6953
	1934.....	36	99·92	± 0·7487	± 4·4924
	1935.....	29 ♂	104·31	± 1·2958	± 6·9783
		113 ♀	98·95	± 0·4600	± 4·8900
4.2+	1932.....	47	85·09	± 0·9031	± 6·1913
	1933.....	76	83·93	± 0·6212	± 5·4159
	1934.....	27 ♂	79·78	± 1·3387	± 6·9564
		138 ♀	80·02	± 0·4891	± 5·7464
	1935.....	78	78·21	± 0·5977	± 5·2788
3.2+	1925.....	28 ♂	82·89	± 1·0907	± 5·7719
		48 ♀	79·60	± 0·6228	± 4·3150
	1926.....	84	79·92	± 0·5884	± 5·3928
	1927.....	22 ♂	84·77	± 0·9337	± 4·3795
		31 ♀	78·12	± 0·8321	± 4·6335
	1928.....	25 ♂	82·96	± 0·8207	± 4·1035
		25 ♀	79·20	± 1·0461	± 5·2307
	1929.....	34	77·88	± 0·8481	± 4·9458
	1930.....	25 ♂	81·88	± 0·8641	± 4·3204
		65 ♀	78·38	± 0·4583	± 3·6953
	1931.....	58	84·67	± 0·7043	± 5·3643
	1932.....	27 ♂	91·11	± 0·6663	± 3·4624
		94 ♀	83·11	± 0·5391	± 5·2276
	1933.....	143 ♂	85·87	± 0·5142	± 6·1501
		564 ♀	82·79	± 0·2523	± 5·9936
	1934.....	64 ♂	82·23	± 0·7344	± 5·8758
		252 ♀	79·61	± 0·3308	± 5·2513
	1935.....	50 ♂	81·58	± 0·6319	± 4·4681
		242 ♀	78·64	± 0·3334	± 5·1858
2.2+	1932.....	48	86·31	± 0·8287	± 5·7416
	1933.....	30	81·23	± 1·1876	± 6·5049
4.1+	1930.....	22	58·73	± 0·8109	± 3·8036
	1934.....	42	51·24	± 0·6673	± 4·3248
3.1+	1925.....	37	54·51	± 0·5587	± 3·3986
	1926.....	24	55·00	± 0·6640	± 3·2532
	1930.....	73	57·93	± 0·4224	± 3·6091
	1932.....	37	56·00	± 0·7460	± 4·5381
	1934.....	110	51·75	± 0·3902	± 4·0934
Oulu River.					
3.4	1923.....	36	114·36	± 0·8390	± 5·0341
	1924.....	24	114·25	± 1·1369	± 5·5696
	1925.....	54	115·57	± 0·8062	± 5·9246
	1926.....	33	115·57	± 1·1579	± 6·6521
	1927.....	34	115·26	± 0·7571	± 4·4149
	1928.....	31 ♂	118·23	± 0·8947	± 4·9818
		55 ♀	111·18	± 0·6459	± 4·7906
	1929.....	64	113·25	± 0·7477	± 5·9817
	1930.....	30 ♂	117·43	± 0·9401	± 5·1493
		96 ♀	111·80	± 0·4134	± 4·0512
	1931.....	31 ♂	119·19	± 0·9197	± 5·1207
		36 ♀	112·61	± 0·9046	± 5·4278
	1932.....	22 ♂	120·41	± 0·6575	± 3·0844
		29 ♀	116·07	± 0·9492	± 5·1120
	1933.....	34 ♂	119·03	± 0·8579	± 5·0028
		28 ♀	114·79	± 0·6743	± 3·5683
	1934.....	44 ♂	117·50	± 0·6244	± 4·1423
		53 ♀	114·06	± 0·4753	± 3·4609
	1935.....	63 ♂	119·59	± 0·6589	± 5·2298
		30 ♀	113·57	± 0·7013	± 3·8440
4.3	1927.....	22	101·50	± 1·7041	± 7·9929
	1932.....	117	103·88	± 0·4609	± 4·9858
	1933.....	106	105·05	± 0·5517	± 5·6808
	1934.....	62	105·95	± 0·6772	± 5·3326
	1935.....	34	105·38	± 0·6759	± 3·9411
3.3	1917.....	34 ♂	104·97	± 1·0510	± 6·1285
		182 ♀	100·95	± 0·2816	± 3·7997
	1918.....	20	104·40	± 1·1233	± 5·0239
	1919.....	20	99·95	± 1·0111	± 4·5219
	1923.....	28	101·71	± 1·0582	± 5·5994
	1924.....	22	103·45	± 1·0923	± 5·1237
	1925.....	106	102·51	± 0·5552	± 5·7161
	1926.....	70	102·67	± 0·6585	± 5·5092
	1927.....	36 ♂	107·91	± 0·8911	± 5·3468
		488 ♀	103·06	± 0·2158	± 4·7689
	1928.....	35 ♂	108·14	± 0·8761	± 5·1833
		165 ♀	102·13	± 0·3572	± 4·5887
	1929.....	181	100·49	± 0·3945	± 5·3074
	1930.....	28 ♂	108·68	± 0·7727	± 4·0885
		137 ♀	102·53	± 0·3989	± 4·6690

Table 27, Appendix A (continued).

	Year	Ind.	Mean		Stand. Dev.
	1931.....	29 ♂	104·10	± 1·3438	± 7·2367
		198 ♀	102·01	± 0·3791	± 5·3343
	1932.....	56 ♂	107·66	± 0·7810	± 5·8441
		480 ♀	103·99	± 0·2292	± 5·0222
	1933.....	43 ♂	109·65	± 0·8378	± 5·4938
		294 ♀	103·90	± 0·2959	± 5·0742
	1934.....	103 ♂	109·56	± 0·5438	± 5·5193
		644 ♀	104·24	± 0·1942	± 4·9293
	1935.....	41 ♂	110·12	± 0·9153	± 5·8610
		401 ♀	104·18	± 0·2292	± 4·5907
2.3	1926.....	35	102·25	± 0·9218	± 5·4532
	1927.....	32	101·56	± 0·8615	± 4·8733
	1930.....	60	102·47	± 0·6278	± 4·8627
	1932.....	46	103·89	± 0·7234	± 4·9135
	1933.....	153	106·05	± 0·3627	± 4·4864
	1934.....	101	104·44	± 0·5061	± 5·0858
	1935.....	172	104·40	± 0·3709	± 4·8647
4.2 -	1931.....	20	83·50	± 1·2777	± 5·7140
3.2 -	1919.....	27	87·40	± 1·0616	± 5·5162
	1921.....	20	77·10	± 2·9987	± 13·4104
	1925.....	24	85·87	± 0·9671	± 4·7383
	1926.....	58	85·48	± 0·7017	± 5·3444
	1927.....	22	85·72	± 1·0109	± 4·7415
	1928.....	30	85·13	± 0·8904	± 4·8768
	1930.....	22 ♂	85·23	± 1·3650	± 6·4025
		31 ♀	84·19	± 1·1188	± 6·2292
	1931.....	87	84·62	± 0·5627	± 5·2485
	1932.....	25 ♂	87·64	± 1·0475	± 5·2374
		52 ♀	85·65	± 0·7571	± 5·4597
	1933.....	26 ♂	89·50	± 1·3046	± 6·6521
		79 ♀	85·84	± 0·6066	± 5·3913
	1934.....	63	86·51	± 0·5934	± 4·7100
	1935.....	33 ♂	86·18	± 1·1514	± 6·6148
		128 ♀	86·14	± 0·4454	± 5·0401
2.2 -	1932.....	23	88·30	± 0·9910	± 4·7526
	1934.....	35	83·06	± 1·1449	± 6·7736
	1935.....	41	86·98	± 0·8990	± 5·7565
3.1 -	1933.....	96	54·11	± 0·5643	± 5·5291
	1934.....	115	57·06	± 0·4751	± 5·0953
	1935.....	21	59·00	± 1·3965	± 6·3994
2.1 -	1933.....	28	52·93	± 0·7708	± 4·0786
	1934.....	31	56·87	± 0·7367	± 4·1017

Kokemäki River.

2.4	1925.....	50	106·22	± 0·9876	± 6·9837
	1926.....	65	111·21	± 0·6830	± 5·5068
	1927.....	22	109·82	± 1·3432	± 6·3001
	1928.....	23	107·13	± 1·7866	± 8·5684
3.3	1925.....	31	93·06	± 1·3593	± 7·5688
2.3	1925.....	63 ♂	95·73	± 0·9141	± 7·2555
		54 ♀	93·56	± 0·6877	± 5·0535
	1926.....	108 ♂	94·99	± 0·6896	± 7·1668
		119 ♀	93·42	± 0·6076	± 6·6282
	1927.....	35 ♂	92·91	± 1·2652	± 7·4853
		53 ♀	92·15	± 0·9447	± 6·8774
	1928.....	30	93·97	± 1·3795	± 7·5560
	1929.....	36	94·11	± 1·3722	± 9·4333
	1930.....	32 ♂	94·56	± 1·2740	± 7·2067
		56 ♀	94·38	± 0·8851	± 6·6237
	1932.....	34	97·94	± 1·2691	± 7·4002
	1934.....	57 ♂	96·40	± 0·8240	[illegible]
		118 ♀	88·97	± 0·7356	[illegible]
	1935.....	41 ♂	97·34	± 0·8614	[illegible]
		57 ♀	91·39	± 0·8254	[illegible]
2.2+	1935.....	20	73·35	± 1·7209	[illegible]

Kymi River.

2.4	1924.....	26	107·04	[illegible]	± 5·[illegible]
	1925.....	54	104·50	[illegible]	± 5·[illegible]
	1926.....	20	108·30	[illegible]	± 6·[illegible]
	1928.....	47	106·43	[illegible]	± 6·7592
	1929.....	44	106·41	[illegible]	± 7·[illegible]
	1930.....	48	108·79	[illegible]	± 5·4[illegible]
	1934.....	22	112·77	[illegible]	± 5·[illegible]
	1935.....	32	112·09	[illegible]	± 6·1[illegible]
3.3	1922.....	27	101·81	[illegible]	± 8·[illegible]
	1925.....	22	93·14	[illegible]	± 7·[illegible]
	1927.....	20	95·65	[illegible]	± 7·[illegible]
	1928.....	45	92·77	[illegible]	± 6·[illegible]
	1930.....	38	94·92	[illegible]	± 5·[illegible]
	1935.....	33	97·30	[illegible]	± 6·[illegible]
2.3	1920.....	20 ♂	96·35	[illegible]	± 7·8376
		60 ♀	89·43	[illegible]	± [illegible]
	1921.....	37 ♂	104·24	[illegible]	± [illegible]
		60 ♀	95·32	[illegible]	± [illegible]
	1922.....	26 ♂	94·80	[illegible]	± [illegible]
		43 ♀	90·69	[illegible]	± [illegible]
	1923.....	29 ♂	97·72	[illegible]	± [illegible]
		88 ♀	88·44	[illegible]	± 4·5527
	1924.....	66	86·09	[illegible]	± 4·2666
	1925.....	73	91·27	[illegible]	± 6·0213
	1926.....	99	93·12	[illegible]	± 7·0127
	1927.....	474	91·54	[illegible]	± 6·8285
	1928.....	304	91·11	[illegible]	± 6·3511
	1929.....	232	91·20	[illegible]	± 5·5634
	1930.....	23 ♂	100·82	[illegible]	± 4·9762
		81 ♀	92·70	[illegible]	± 3·8302
	1931.....	41	94·76	[illegible]	± 5·5553
	1932.....	65 ♂	100·75	[illegible]	± 4·5513
		104 ♀	92·17	[illegible]	± 4·2279
	1933.....	30 ♂	103·93	[illegible]	± 5·4223
		50 ♀	94·50	[illegible]	± 4·2297
	1934.....	207	94·93	[illegible]	± 6·5596

Table 27, Appendix A (continued).

	Year	Ind.	Mean		Stand. Dev.
	1935.....	24 ♂	100·25	± 0·8922	± 4·3708
		87 ♀	94·00	± 0·6003	± 5·5997
3.2+	1921.....	20	80·70	± 1·7651	± 7·8937
	1926.....	23	75·87	± 1·3178	± 6·3197
	1927.....	38	73·97	± 0·7449	± 4·5919
	1932.....	48	79·81	± 0·6143	± 4·2561
2.2+	1920.....	90	76·80	± 0·4910	± 4·6576
	1921.....	56	76·73	± 0·9012	± 6·7443
	1922.....	73	76·53	± 0·6522	± 5·5721
	1925.....	46	76·80	± 0·9952	± 6·7495
	1926.....	396	73·30	± 0·3116	± 6·1998
	1927.....	207	74·58	± 0·3873	± 5·5727
	1928.....	111	73·23	± 0·5232	± 5·5118
	1929.....	51	75·18	± 0·7516	± 5·3676
	1930.....	20	79·20	± 1·3903	± 6·2177
	1931.....	34 ♂	80·12	± 0·7019	± 4·0927
		151 ♀	76·03	± 0·3552	± 4·3649
	1932.....	40 ♂	84·60	± 0·7104	± 4·4933
		242 ♀	77·09	± 0·2884	± 4·4874
	1934.....	30	75·14	± 0·8482	± 4·6455
	1935.....	28	75·68	± 1·0089	± 5·3387
2.1+	1920.....	20	55·95	± 0·9123	± 4·0801
	1921.....	37 ♂	54·81	± 0·6750	± 4·1058
		44 ♀	54·73	± 0·6101	± 4·0468
	1925.....	38	56·50	± 0·8525	± 5·2553
	1926.....	98	53·28	± 0·4005	± 3·9645
	1931.....	22 ♂	57·86	± 0·6244	± 2·9289
		54 ♀	57·91	± 0·5438	± 3·9960
	1932.....	36	54·64	± 0·8288	± 4·9729
	1935.....	20	58·55	± 0·8499	± 3·8010

I have obtained a good, or fairly satisfactory, result on rare occasions only which I give in age-group percentages of catch statistics (A series) on the one hand, and of scale specimen analysis (B series) on the other.

Age (Years)		3	4	5	6	7	8	>8	Number of salmon
Tornio.									
1930	A:	0·3	11·6	26·0	35·0	19·8	6·2	1·1	1766
	B:	0·2	11·4	25·7	40·8	15·9	5·2	0·8	483
1931	A:	0·2	8·9	34·2	33·0	16·3	6·2	2·0	1336
	B:	0·9	6·5	35·8	44·4	7·4	3·0	1·3	1032
1935	A:	0·7	22·7	24·1	28·4	17·2	5·8	1·1	1473
	B:	0·5	37·2	23·9	27·4	10·1	0·7	0·2	887
Kemi.									
1926	A:	0·6	9·6	44·9	29·7	8·5	4·7	2·0	1009
	B:	—	13·6	41·4	30·0	5·9	7·3	1·8	220
1927	A:	1·0	11·3	31·8	40·7	9·0	4·3	1·9	1766
	B:	0·6	7·0	34·5	50·9	4·1	0·6	2·3	171
1930	A:	1·3	12·7	20·9	42·2	15·8	5·2	1·9	1831
	B:	0·5	13·3	21·4	33·0	21·4	9·2	1·2	594
1932	A:	0·1	2·4	20·0	52·4	17·6	5·4	2·1	780
	B:	0·1	8·6	15·4	45·4	22·5	5·8	2·3	989[1]
1934	A:	0·2	4·0	24·2	52·8	12·5	4·4	1·9	1535
	B:	0·2	5·2	16·2	68·8	6·0	2·7	0·9	2502[1]
1935	A:	0·5	6·2	26·5	47·4	12·7	4·8	1·9	1315
	B:	0·1	1·7	25·7	54·3	16·0	1·8	0·4	1695[1]

[1]) The specimens also include salmon obtained from the Kemi River estuary (Valkeakari).

Oulu.									
1925	A:	2·0	11·3	14·5	38·3	26·0	6·3	1·6	697
	B:	—	3·9	14·4	44·0	24·5	10·1	3·1	257
1928	A:	1·3	7·9	15·0	46·4	22·0	5·9	1·5	459
	B:	—	3·6	11·6	54·3	27·9	2·6	—	394
1929	A:	0·6	2·7	11·6	53·1	24·6	5·9	1·5	337
	B:	—	0·6	8·2	58·4	26·2	6·6	—	317
1931	A:	—	0·4	12·0	53·3	26·9	6·2	1·2	484
	B:	—	1·0	21·4	55·2	16·0	4·6	1·8	482
Kokemäki.									
1926	A:	2·8	8·7	48·6	22·1	12·2	5·1	0·5	434
	B:	0·2	4·6	55·8	19·1	15·6	2·6	2·1	418
1927	A:	2·0	11·2	48·3	19·0	13·6	5·4	0·5	205
	B:	—	1·5	46·7	18·5	23·6	8·2	1·5	195
1931	A:	—	21·4	17·9	32·1	25·0	3·6	—	28
	B:	—	21·5	10·7	32·1	32·1	—	3·6	28
1932	A:	—	7·9	43·4	34·2	11·9	2·6	—	76
	B:	—	7·2	44·6	25·3	19·3	1·2	2·4	83
Kymi.									
1926	A:	15·7	53·6	18·2	2·1	6·9	3·2	0·3	725
	B:	13·7	57·0	17·8	5·8	2·8	2·0	0·9	721
1931	A:	18·8	41·3	21·6	7·7	7·4	3·0	0·2	431
	B:	18·0	46·3	13·5	6·5	11·9	1·9	1·9	428
1932	A:	5·1	50·3	29·6	4·8	6·8	3·1	0·3	585
	B:	6·5	48·3	37·4	2·9	2·0	0·7	2·2	588
1935	A:	7·4	17·5	40·9	21·6	8·9	3·3	0·4	269
	B:	7·6	11·5	44·7	26·3	8·0	1·1	0·8	262

Table 27, Appendix B. Grilse less than 50 cm. in Length.
Number of Individuals.

Length cm	Tornio						Kemi					Oulu					Kymi							Total
	1930	1931	1932	1933	1934	1935	1932	1935	1936	1937	1932	1933	1934	1933	1934	1935	1921	1925	1926	1927	1928	1931	1932	1934	1921–1935
49	3	—	12	33	30	19	—	2	1	—	2	1	[illegible]	11	3		4	1	1				1	1	[illegible]
48	5	—	7	26	22	22	—	1	—	—	—	1	24	1	1	—	[illegible]		1	1	1	1			[illegible]
47	3	1	14	23	22	16	1	1	1	1	—	—	16	5	2	—	1	—	1	—	—	—		1	[illegible]
46	3	—	13	11	31	10	—	1	—	—	—		4	4	1										[illegible]
45	—	2	9	10	28	15	—	—	—	1	—	1	5	9	1	1			2			1	1		[illegible]
44	—	1	11	5	4	3	—	—	—	—	—	1	3	1					1						[illegible]
43	—	—	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—	1	—	—	—	1	—	—	1	1	1				1	[illegible]
42	—	1	—	—	3	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	5
41	—	—	1	[illegible]	[illegible]	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	1	—	8
40	—	—	1	[illegible]			—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	7
39	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
38	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
37	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
36	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
Total	14	5	[illegible]	[illegible]	143	86	2	5	2	2	3	5	65	28	10	2	8	3	16	2	1	2	3	4	617
Grand Total of grilse	103	109	190	436	360	380	3	47	26	3	45	11	165	139	166	28	84	43	111	26	20	90	38	11	2634
%	13·6	4·6	43·2	28·4	39·7	22·6	—	10·6	7·7	—	6·7	—	39·4	20·1	6·0	7·1	9·5	7·0	14·4	7·7	5·0	2·2	7·9	—	23·4

For most years, however, these comparative results have been fairly unsatisfactory. The reason for this may be the inaccurate limits of the weight-classes as regards the ascending salmon (b) [illegible] and consequent erroneous placing in weight-classes. [illegible] with regard to this point it should be mentioned that on occasions small specimens have been taken away from the larger salmon caught, and the smaller ones omitted entirely, (d) the number of previously ascended salmon may have been over- or under-estimated (e. g., the Tornio area in 1932—34).

The most usual "mixing up" is due to the age-groups of highest individual abundance being "crosswise", as will be seen from the following table.

Age Years	3	4	5	6	7	8	>8	Number of salmon
Tornio.								
1932 A:	0·5	20·6	29·2	27·0	22·2	8·2	1·3	9291
B:	—	33·5	18·5	27·7	15·9	2·8	1·6	498
1933 A:	0·8	26·6	33·4	21·6	11·6	5·4	1·2	17191
B:	0·4	22·3	54·4	16·2	7·7	1·9	0·1	1055
1934 A:	0·3	11·5	28·6	34·0	18·7	6·1	1·1	33541
B:	0·1	7·2	38·4	52·2	5·0	1·4	0·7	2237
Kemi.								
1925 A:	1·8	17·4	20·9	31·0	20·3	6·6	2·0	17591
B:	1·4	11·6	21·6	19·8	27·3	14·2	4·7	424
1928 A:	0·4	7·6	37·4	38·4	10·3	4·4	1·8	13691
B:	—	4·0	17·4	57·2	15·2	5·6	0·6	327
1929 A:	0·4	5·4	23·7	46·6	16·8	5·3	1·8	13811
B:	0·9	9·0	54·3	27·1	7·3	0·9	0·5	587
1931 A:	—	4·7	35·5	37·5	15·0	5·7	1·6	3661
B:	1·9	4·3	28·1	45·7	11·0	4·8	3·8	210
1933 A:	0·9	11·6	33·0	38·6	9·1	4·9	1·9	536 [1]
B:	—	2·1	61·5	25·3	7·8	2·5	0·8	1542 [1] [2]
Oulu River.								
1926 A:	5·2	28·8	19·1	28·4	11·9	5·0	1·6	514
B:	0·4	1·9	36·3	33·6	15·0	5·4	7·4	259 [2]
1927 A:	1·6	9·5	18·6	55·0	10·3	3·5	1·5	1230
B:	—	0·4	8·0	79·7	9·7	0·9	1·3	679 [2]
1928 A:	1·8	7·9	15·0	46·4	22·0	5·9	1·5	459
B:	—	3·6	11·6	54·3	27·9	2·6	—	394 [2]
1930 A:	2·7	13·4	10·6	36·7	27·6	7·4	1·6	566
B:	—	2·1	24·0	39·1	29·9	4·3	0·6	471 [2]
1932 A:	2·0	10·5	12·7	49·7	18·5	5·1	1·5	1079
B:	—	2·5	13·3	61·4	19·4	2·6	0·8	924 [2]
1933 A:	2·1	10·8	9·8	38·5	29·6	7·6	1·6	1311
B:	2·9	10·8	27·1	36·7	17·8	4·0	0·7	1014
1934 A:	3·9	18·8	10·0	34·0	26·1	6·1	1·4	1614
B:	2·2	11·5	13·6	57·1	12·6	2·3	0·7	1369
1935 A:	0·4	3·8	16·2	39·1	29·7	9·0	1·8	10841
B:	0·4	5·7	31·1	44·5	13·3	4·0	1·0	1084

[1] Salmon from the Kemi River Estuary (Valkeakari) also included.
[2] Probably no scale specimens of grilse collected.

Age (Years)		3	4	5	6	7	8	>8	Number of salmon
Kokemäki.									
1925	A:	1·2	14·6	56·7	16·4	7·6	3·2	0·3	591
	B:	0·4	3·5	52·2	37·1	6·0	0·4	0·4	232
1928	A:	2·8	8·5	47·1	23·6	12·3	5·7	—	106
	B:	—	3·0	31·0	36·0	14·0	7·0	9·0	100
1929	A:	—	14·7	50·0	18·6	10·8	5·9	—	102
	B:	—	5·3	38·9	24·2	25·3	2·1	4·2	95
1930	A:	0·8	9·0	59·0	14·8	11·5	4·9	—	122
	B:	—	—	75·0	15·8	3·3	4·2	1·7	120
1934	A:	4·0	13·2	49·7	20·0	9·1	4·0	—	175
	B:	—	5·6	74·7	14·8	3·7	—	1·2	162
1935	A:	3·7	19·1	44·2	20·2	9·6	3·2	—	188
	B:	—	11·6	61·6	19·8	7·0	—	—	172
Kymi.									
1921	A:	32·9	27·3	22·7	6·4	7·4	3·0	0·3	596
	B:	25·3	18·0	38·7	11·0	4·0	1·2	1·8	328
1922	A:	10·3	39·2	35·8	4·6	6·7	3·1	0·3	1149
	B:	0·4	33·9	31·7	21·2	10·1	1·8	0·9	227
1923	A:	1·4	27·2	52·9	8·4	6·7	3·0	0·4	1038
	B:	—	2·7	80·4	11·5	3·4	0·7	1·3	148
1924	A:	1·8	24·5	50·6	12·4	7·4	3·0	0·3	621
	B:	1·4	5·6	47·9	31·2	10·4	2·1	1·4	144
1925	A:	14·9	18·9	43·0	12·4	7·5	2·9	0·4	518
	B:	10·7	14·4	24·5	23·1	25·1	1·7	0·5	355
1927	A:	3·6	45·9	36·5	4·0	7·4	2·5	0·1	813
	B:	2·1	26·7	64·0	4·9	0·9	0·4	1·0	811
1928	A:	3·5	38·3	40·6	7·2	7·1	3·0	0·3	596
	B:	2·5	20·9	53·9	17·3	3·4	0·6	1·4	594
1929	A:	3·1	28·4	48·2	9·7	7·3	3·1	0·2	423
	B:	2·8	12·6	59·7	16·4	6·6	0·5	1·4	422
1930	A:	4·6	6·1	65·1	13·0	7·3	3·5	0·4	261
	B:	5·8	8·5	42·7	34·6	6·9	1·1	0·4	260
1933	A:	0·8	9·3	51·3	19·3	14·3	5·0	—	119
	B:	—	7·7	72·6	15·4	1·7	0·9	1·7	117
1934	A:	4·9	15·8	50·2	17·4	8·1	3·2	0·4	247
	B:	2·5	10·4	69·7	13·9	1·6	—	1·9	317

It can be assumed with fairly good reason that the above statistics of catches of salmon from the Bothnian Bay northern salmon area (also Kokemäki and Kymi Rivers) for the years 1921—35, divided into weight-classes, give no clear, but a somewhat unreliable, view of the age-groups of the salmon. I have nevertheless converted the age-group percentages into year-class numbers, and have obtained the results given below.

	Tornio		Kemi		Simo	Ii and Haukipudas	Oulu		Total		
	(A)	(B)	(A)	(B)	(A)	(A)	(A)	(B)	(A)	(B)	(C)
1913/14	1273	—	1316	—	—	—	[150]	—	2739	—	—
1914/15	**3881**	—	**3057**	—	—	[232]	507	—	7677	—	7767
1915/16	**3302**	—	**3743**	125[4])	[542]	[1411]	612	130[4])	9610	—	9925
1916/17	1767	—	2162	103[4])	[2111]	1059	516	109[4])	7615	—	7809
1917/18	1274	—	1762	214	2739	846	669	127[4])	7290	—	7466
1918/19	737	—	1069	109	2220	564	495	160[4])	**5085**	—	**5037**
1919/20	1299	—	950	186	3036	886	419	202[4])	6590	—	6401
1920/21	**2075**	—	**1728**	326	**6700**[2])	**2352**	**984**	**784**	**13839**[2])	1110	**13820**[2])
1921/22	1991	—	1547	512	**5569**	1608	735	382	11450	894	11273
1922/23	2715	[117][1])	1684	544	4932	1090	594	405	11015	1066	10996
1923/24	1726	[292]	1324	354	3968	784	509	332	8311	978	8511
1924/25	1299	689	791	508	4438	842	655	611	8025	1808	7979
1925/26	1333	676	919	777	**5910**	1233	1177	**899**	10572	2352	10567
1926/27	1397	450	658	735	3866	1430	1179	716	8530	1901	8724
1927/28	**2164**	**1975**	**1173**	**3030**[3])	4871	**2371**	1112	**1224**	11691	**6229**	**12026**
1928/29	1821	**1227**	1057	**1359**[3])	4315	1719	749	778	9661	3364	9966
1929/30	753	377	415	566	1981	749	506	523	4404	1466	4487
Total...	**30807**	**5803**	**25355**	**9448**	**57198**	**19176**	**11568**	**7382**	**144104**	**21168**	**142754**

[1]) Do not include salmon caught previous to 1930.
[2]) The figure would be still higher but for the omission of the Maksniemi data for 1927, when the salmon of the 1920/21 year-class were in the cycle 3.3(+).
[3]) Also include salmon from estuary of Kemi River (Valkeakari).
[4]) Scale specimens taken from only small number of fish.

This table dealing with salmon from the Bothnian Bay salmon area gives in the (A)-column the number of individuals belonging to the different year-classes according to the converted age-group division of Table 28, and in the (B)-column the salmon belonging to the scale specimens, also in year-classes. (A)-column thus gives the salmon taking into consideration the assumed number of previously spawned individuals, while the (C)-column assumes all the salmon to be ascending to the spawning waters for the first time.

The picture given by the columns (A) and (C) of this table varies considerably from that yielded by the scale analysis, i. e., the (B)-column. The table nevertheless provides one or two points that should be mentioned specially, although no great value should be attributed as proof to the table.

The first point is: that the scale specimens from small numbers of fish selected from large catches are insufficient to provide an explanation of the individual abundance of the year-classes, especially while they are young as the collector has been compelled to devote more attention to the large than to the small fish. Under these circumstances the scale specimens which were collected for my investigations prior to 1925 are not very representative. Despite their incompleteness, my calculations based on weight-classes for this period — 1921—24 — provide a better illustration.

Another fact produced by the table is that collecting stations must be numerous and distant from one another. It is to be regretted that no scale specimen collecting base has existed in the Simo area for example. Among other things the scale specimens have shown that the 1927—28 year-class has been best represented. It also appears abundant (although occupying but second place) in columns (A) and (C) of the table under discussion but is appreciably smaller than in the (B)-column. This is presumably due (apart from a partial levelling for the benefit of the following year-class) to the fact that representatives of this year-class in the Simo fishing area are not abundant according to weight-class statistics. This, of course, may be due to errors in weighing. Other factors may possibly have influenced this result: climatic conditions (wind etc.) may have caused decreased fishing in the Simo area in 1934, and this indeed is very probably the case, as the fish caught in this area in 1934 do not indicate a rise on the previous year. During this year the 1927—28 year-class was at its most important spawning age, i. e., in the cycle 3.3. As the year-class was caught to a limited extent only in the Simo area while in this cycle, it has naturally followed that the proportion of this year-class has been higher in other fishing areas.

The probability of the above explanation is strengthened by the observation that the year-class 1920—21, which was only weakly represented in the scale specimens collected in 1926 and 1927, reaches a higher individual figure in the combined summary [(A) and (C)-columns] on the basis of the Simo catch. It would therefore appear that in both these cases the weather conditions prevailing during the fishing season have had a marked influence on the distribution of the catch in different areas.

It should be mentioned that the weakest individual year-class is 1918—19 in columns (A) and (C) of the table.

I will add to this chapter a survey of the results yielded by the statistics divided into weight-classes, and the grouping of salmon from the Kokemäki and Kymi Rivers into year-classes, although with the exception of 1921—24 they are of little importance, as the scale analysis of subsequent years has taken into account practically all individual salmon caught. [(A) and (B)-columns have the same significance as in the preceding table.]

	Kokemäki		Kymi	
Year-class	(A)	(B)	(A)	(B)
1914/15	106	—	148	162
1915/16	182	—	279	286
1916/17	194	—	725	197
1917/18	414	—	**1337**	437 [3]
1918/19	462	171	850	187
1919/20	**619**	**260**	484	151
1920/21	370	**294**	330	244
1921/22	186	176	847	**1113**
1922/23	119	63	804	741
1923/24	91	70	545	543
1924/25	113	121	391	224
1925/26	63	24	176	112 [3]
1926/27	90	49	415	459
1927/28	159	42 [1]	503	510
1928/29	137	155	223	338
1929/30	114	115	150	150
Total...	3419	1540	8207	5854

[1] Scale specimens are entirely missing from the year 1933 when the year-class 1927/28 was in the cycle 2.3.

[2] Scale specimens from some of the fish only.

[3] Scale specimens from all salmon; additional specimens from sea in 1934 caused the increase in the year-class 1928/29.

Table 28A. **Catch Statistic for various Fishing Grou**

Weight-Classes	Tornio Region	Kemi Region	Simo Maksniemi Kuivaniemi	Ii Haukipudas	Oulu River	Total	Tornio Region	Kemi Region	Simo Maksniemi Kuivaniemi	Ii Haukipudas	Oulu River	T
kg.				**1921**						**1925**		
> 19		11			4	**15**	6	10	22	7	5	
13·5—19	—	1032	—	—	104	**1136**	53	373	339	111	205	1
7·5—13	3979	2861	—	—	481	**7321**	521	678	1411	316	334	3
3·5— 7	2	1396	—	—	83	**1532**	66	345	732	162	60	1
1— 3	—	259	—	—	43	**310**	183	353	2787	613	93	4
Total...	3981	5559	—	—	715	**10314**	829	1759	5291	1209	697	9
				1922						**1926**		
> 19	1	1	—	3	2	**7**	3	5	7	1	7	
13·5—19	31	432	—	17	98	**578**	30	71	101	59	59	
7·5—13	3922	2578	—	1595	450	**8545**	646	332	1252	418	194	2
3·5— 7	61	317	—	179	20	**577**	426	539	3131	914	72	5
1— 3	5	22	—	23	34	**84**	74	62	1454	240	182	2
Total...	4020	3350	—	1817	604	**9791**	1179	1009	5945	1632	514	10
				1923						**1927**		
> 19	8	10	9	9	—	**36**	4	5	2	2	1	
13·5—19	100	233	147	40	81	**601**	44	83	65	41	60	
7·5—13	1732	1109	1960	816	252	**5869**	1563	896	1345	1113	925	5
3·5— 7	156	623	889	299	33	**2000**	249	595	705	449	111	2
1— 3	41	5	138	58	4	**246**	51	187	196	115	133	
Total...	2037	1980	3143	1222	370	**8752**	1911	1766	2313[1])	1720	1230	8
				1924						**1928**		
> 19	2	2	9	1	8	**22**	6	—	9	2	5	
13·5—19	41	259	150	19	136	**605**	181	96	191	38	101	
7·5—13	1318	855	1787	445	458	**4863**	966	627	3058	824	276	5
3·5— 7	42	259	484	82	50	**917**	1687	577	2648	364	36	5
1— 3	13	19	72	7	6	**117**	507	60	87	127	41	
Total...	1416	1394	2502	554	658	**6524**	3347	1360	5993	1355	459	12

[1]) Maksniemi missing.

Table 28B. **Catch Statistics for various Fishing Grounds in 1921—1925.**
Divided into Weight-Classes.

kg.	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
						Kokemäki River.									
> 19.....	1	—	—	—	—	1	5	—	—	—	3	—	—	1	—
13·5—19.....	57	10	29	13	66	90	35	24	17	13	10	25	17	29	34
7·5—13.....	164	104	157	166	418	287	135	68	68	95	8	44	128	112	105
3·5— 7.....	31	206	169	123	99	42	25	11	17	13	7	7	13	25	41
1— 3.....	14	9	54	17	8	14	5	3	—	1	—	—	9	8	8
Total...	267	329	409	319	591	434	205	106	102	122	28	76	167	175	188

[illegible]921—1925. Divided into Weight-Classes.

Kemi Region	[illegible]	II Haukipudas	[illegible] River	Total	[illegible]	[illegible]	Simo Maksniemi Kuivaniemi	II Haukipudas	Oulu River	Total
		1929					1933			
1	10	6	[illegible]	32	12	2	[illegible]	[illegible]	[illegible]	68
183	225	57	81	783	162	29	174	109	[illegible]	914
814	1849	520	235	4574	350	258	2101	942	[illegible]	4286
326	1259	198	8	2338	553	190	2687	1013	[illegible]	4474
57	106	61	10	297	642	57	581	114	182	1576
1381	3449	839	337	8024	1719	536	5566	2186	[illegible]	11318
		1930					1934			
1	11	—	[illegible]	34	20	2	[illegible]	[illegible]	[illegible]	40
236	[illegible]	89	176	975	403	100	180	108	[illegible]	1278
994	2391	387	262	4756	1271	1038	2121	1401	[illegible]	6524
341	1147	182	19	2222	1127	358	2493	607	[illegible]	4620
259	1456	382	98	2459	533	37	466	372	[illegible]	1805
1831	5243	1040	566	10446	3354	1535	5274	2490	1614	14267
		1931					1935			
1	15	4	2	36	11	5	[illegible]	[illegible]	31	63
49	120	34	132	485	158	103	136	123	[illegible]	881
164	2298	510	336	3642	527	789	1735	1070	[illegible]	4640
147	2509	396	14	3457	294	354	1377	316	[illegible]	2476
5	245	107	—	514	483	64	904	393	[illegible]	1872
366	1897	1051	484	8184	1473	1315	4156	1904	[illegible]	9932
		1932								
3	10	2	8	32						
102	446	20	179	917						
524	2796	394	719	4762						
143	952	92	27	1359						
8	456	59	146	945						
780	4660	567	1079	8015						

Table 28B (continued).

kg.	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Kymi River.															
19 .	1				—	1	—	—	1					1	1
13.5—19 .	40	34	44	57	52	23	12	31	28	21	36	25	22	36	56
7.5—13 .	177	488	659	381	279	147	349	285	245	210	113	197	84	154	139
3.5—7 .	155	493	318	170	100	425	419	256	134	16	190	329	12	42	50
1—3	223	134	17	13	87	129	33	24	15	14	92	34	1	14	23
Total	596	1149	1038	621	518	725	813	596	423	261	431	585	119	247	269

Table 29. **Converted Age-Cla**

Years:	3	4	5	6	7	8	> 8		3	4	5	6	7	8
	Number								Percentage					
	Tornio Region.													
1921	—	1	78	2625	1160	81	36	**3981**	—	—	2·0	65·9	29·2	2·0
1922	—	4	120	2603	1164	93	36	**4020**	—	0·1	20·5	47·2	29·0	2·3
1923	1	31	152	1185	570	78	20	**2037**	0·04	1·5	7·5	58·2	28·0	3·8
1924	—	10	57	882	412	41	14	**1416**	—	0·7	4·0	62·3	29·1	2·9
1925	4	125	111	358	184	37	10	**829**	0·5	15·1	13·4	43·2	22·2	4·4
1926	2	58	324	545	204	34	12	**1179**	0·2	4·9	27·5	46·2	17·3	2·9
1927	1	40	214	1100	483	55	18	**1911**	0·05	2·1	11·2	57·6	25·3	2·9
1928	10	379	1316	1099	385	126	32	**3347**	0·3	11·3	39·3	32·8	11·5	3·8
1929	1	54	413	914	491	122	23	**2018**	0·04	2·7	20·5	45·3	24·3	6·1
1930	6	204	460	619	349	109	19	**1766**	0·3	11·6	26·0	35·0	19·8	6·2
1931	3	119	457	441	218	82	16	**1336**	0·2	8·9	34·2	33·0	16·3	6·2
1932	5	191	188	251	206	76	12	**929**	0·5	20·6	20·2	27·0	22·2	8·2
1933	13	447	575	372	200	92	20	**1719**	0·8	26·0	33·4	21·6	11·6	5·4
1934	11	385	950	1141	627	204	36	**3354**	0·3	11·5	28·3	34·0	18·7	6·1
1935	10	334	355	419	254	85	16	**1473**	0·7	22·7	24·1	28·4	17·2	5·8
	Simo.													
1922	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1923	12	188	884	1576	283	96	104	**3143**	0·4	6·0	28·1	50·1	9·0	3·1
1924	7	100	545	1406	279	81	84	**2502**	0·3	4·0	21·8	56·2	11·2	3·2
1925	251	2240	1055	1089	300	178	178	**5291**	4·7	42·3	19·9	20·6	5·7	3·4
1926	131	1416	2683	1354	181	102	78	**5945**	2·2	23·8	45·2	22·8	3·0	1·7
1927	18	216	693	1059[2])	186	94	47	**2313**[2])	0·8	9·3	30·0	45·8	8·0	4·1
1928	8	306	2345	2515	445	251	123	**5993**	0·1	5·1	39·1	42·0	7·4	4·2
1929	10	195	1159	1493	358	164	70	**3449**	0·3	5·6	33·6	43·3	10·4	4·8
1930	129	1223	1290	1841	429	229	102	**5243**	2·5	23·3	24·6	35·1	8·2	4·4
1931	22	399	1889	1967	291	222	107	**4897**	0·4	8·2	38·6	40·2	5·9	4·5
1932	41	442	1047	2166	632	236	96	**4660**	0·9	9·5	22·5	46·5	13·6	5·0
1933	52	695	2354	1791	315	242	117	**5566**	0·9	12·5	42·3	32·2	5·7	4·3
1934	42	587	2190	1797	332	222	104	**5274**	0·8	11·1	41·5	34·1	6·3	4·2
1935	81	829	1342	1389	262	168	85	**4156**	1·9	20·0	32·3	33·4	6·3	4·1
	Oulu River.													
1921	7	45	135	162	121	35	10	**515**	1·4	8·7	26·2	31·5	23·5	6·8
1922	5	29	83	342	116	24	5	**604**	0·8	4·8	13·7	56·6	19·2	4·0
1923	1	8	61	192	84	19	5	**370**	0·3	2·2	16·5	51·9	22·7	5·1
1924	1	12	104	347	144	40	10	**658**	0·2	1·8	15·8	52·7	21·9	6·1
1925	14	79	101	267	181	44	11	**697**	2·0	11·3	14·5	38·3	26·0	6·3
1926	27	148	98	146	61	26	8	**514**	5·2	28·8	19·1	28·4	11·9	5·0
1927	20	117	229	676	127	43	18	**1230**	1·6	9·5	18·6	55·0	10·3	3·5
1928	6	36	69	213	101	27	7	**459**	1·3	7·9	15·0	46·4	22·0	5·9
1929	2	9	39	179	83	20	5	**337**	0·6	2·7	11·6	53·1	24·6	5·9
1930	15	76	60	208	156	42	9	**566**	2·7	13·4	10·6	36·7	27·6	7·4
1931	—	2	58	258	130	30	6	**484**	—	0·4	12·0	53·3	26·9	6·2
1932	22	113	137	536	200	55	16	**1079**	2·0	10·5	12·7	49·7	18·5	5·1
1933	27	142	129	505	388	99	21	**1311**	2·1	10·8	9·8	38·5	29·6	7·6
1934	59	303	161	548	422	98	23	**1614**	3·9	18·8	10·0	34·0	26·1	6·1
1935	4	41	176	424	322	98	19	**1084**	0·4	3·8	16·2	39·1	29·7	9·0

[1]) Obtained from rivers only.
[2]) Maksniemi missing.

Table 28 material, see explanation, p 88)

4	5	6	7	8	9+		3	4	5	6	7	8+	9+
Number							Percentage						
												Kemi Region.	
328	1357	2304	1103	334	110	**5559**	0·4	5·9	24·4	41·5	19·8	6·0	2·0
46	468	1968	627	174	65	**3350**	0·1	1·4	14·0	58·7	18·7	5·2	1·9
60	378	896	302	105	39	**1980**	—	3·0	29·2	45·3	15·2	5·3	2·0
38	253	677	300	81	21	**1394**	0·2	2·7	19·7	48·6	21·5	5·8	1·5
306	368	545	357	116	35	**1759**	1·8	17·4	20·9	31·0	20·3	6·6	2·0
97	453	300	86	47	20	**1009**	0·6	9·6	44·9	29·7	8·5	4·7	2·0
200	561	719	159	76	34	**1766**	1·0	11·3	31·8	40·7	9·0	4·3	1·9
99	508	523	140	60	25	**1360**	0·4	7·3	37·4	38·4	10·3	4·4	1·8
74	428	644	232	73	25	**1881**	0·4	5·4	23·7	46·6	16·8	5·3	1·8
255	582	773	289	96	35	**1881**	1·3	12·7	20·9	42·2	15·8	5·2	1·9
17	130	137	55	21	6	**366**	—	4·7	35·5	37·5	15·0	5·7	1·6
19	156	409	137	42	16	**780**	0·1	2·4	20·0	32·4	17·6	5·4	2·1
62	177	207	49	26	10	**536**[1])	0·9	11·6	33·0	38·6	9·1	4·9	1·9
61	341	810	192	68	30	**1535**	0·2	4·0	24·2	52·8	12·5	4·4	1·9
82	349	623	167	63	25	**1315**	0·5	6·2	26·5	47·4	12·7	4·8	1·9
												Ii and Haukipudas.	
34	287	1269	220	4	1	**1817**	0·1	1·9	15·8	69·8	12·1	0·2	0·1
72	314	680	138	12	1	**1222**	0·4	5·9	25·7	55·6	11·3	1·0	0·1
12	105	360	73	3	—	**554**	0·2	2·2	18·9	65·0	13·2	0·5	—
493	234	278	129	19	1	**1200**	4·5	40·8	19·3	23·0	10·7	1·6	0·1
269	782	450	100	9	—	**1632**	1·3	16·5	47·9	27·6	6·1	0·6	—
331	465	930	177	7	—	**1720**	0·6	7·6	27·0	54·1	10·3	0·4	–
182	355	693	137	7	—	**1355**	0·8	9·7	27·7	51·2	10·1	0·5	—
66	209	436	113	9	1	**839**	0·6	7·8	24·9	52·0	13·5	1·1	0·1
514	227	334	119	12	—	**1040**	3·3	30·2	21·8	32·1	11·4	1·2	—
112	569	452	93	7	1	**1051**	1·0	11·3	35·1	43·0	8·8	0·7	0·1
54	116	321	66	5	—	**567**	0·9	9·5	20·5	56·6	11·6	0·9	—
180	890	877	208	20	1	**2186**	0·5	8·2	40·7	40·1	9·5	0·9	0·1
715	647	1182	266	16	—	**2490**	1·4	13·9	26·0	47·4	10·7	0·6	
535	394	887	235	18	—	**1904**	1·8	17·6	20·7	46·6	12·4	0·9	—
												Bothnian Bay (Summary).	
370	1858	5838	2024	193	3	**10314**	0·3	3·6	18·0	56·6	19·6	1·9	—
115	1215	6553	1802	95	1	**9791**	0·1	1·2	12·4	66·9	18·4	1·0	—
365	2067	4776	1393	123	6	**8752**	0·3	4·2	23·6	54·6	15·9	1·4	0·1
170	1145	3848	1234	113	4	**6524**	0·2	2·6	17·6	59·0	18·9	1·7	0·1
3145	1962	2760	1358	210	8	**9785**	3·7	32·1	20·1	28·2	13·7	2·1	0·1
1966	4300	2973	697	68	4	**10279**	1·8	19·1	42·7	28·9	6·8	0·7	—
702	2217	4744	1156	58	2	**8940**	0·7	7·9	24·8	53·1	12·9	0·6	—
1094	4634	5218	1377	113	4	**12514**	0·6	8·7	37·0	41·7	11·0	0·9	—
433	2213	3875	1322	149	5	**8024**	0·3	5·4	27·6	48·3	16·5	1·9	0·1
2044	2488	4011	1495	182	5	**10446**	2·1	19·6	23·8	38·4	14·3	1·7	—
697	3003	3328	950	104	6	**8134**	0·6	8·6	36·9	40·9	11·7	1·3	0·1
831	1599	3871	1453	171	5	**8015**	1·1	10·4	20·0	48·3	18·1	2·1	0·1
1585	3993	4012	1378	197	11	**11318**	1·3	14·0	35·3	35·4	12·2	1·7	0·1
1770	4341	5745	2097	254	6	**14267**	1·1	12·4	30·4	40·3	14·1	1·6	—
1027	2575	3955	1409	188	10	**9932**	1·7	16·4	25·9	39·8	14·2	1·9	0·1

Tab

Years:	3	4	5	6	7	8	>8		3	4	5	6	7	8
	Number								Percentage					
	Kokemäki River.													
1921	12	29	128	63	24	10	1	**267**	4·5	10·9	47·9	23·6	9·0	3·7
1922	8	178	90	12	28	12	1	**329**	2·4	54·1	27·4	3·6	8·5	3·6
1923	46	153	133	33	29	14	1	**409**	11·2	37·4	32·5	8·1	7·1	3·4
1924	15	108	140	23	21	11	1	**319**	4·7	33·9	43·9	7·2	6·6	3·4
1925	7	86	335	97	45	19	2	**591**	1·2	14·6	56·7	16·4	7·6	3·2
1926	12	38	211	96	53	22	2	**434**	2·8	8·7	48·6	22·1	12·2	5·1
1927	4	23	99	39	28	11	1	**205**	2·0	11·2	48·3	19·0	13·6	5·4
1928	3	9	50	25	13	6	—	**106**	2·8	8·5	47·1	23·6	12·3	5·7
1929	—	15	51	19	11	6	—	**102**	—	14·7	50·0	18·6	10·8	5·9
1930	1	11	72	18	14	6	—	**122**	0·8	9·0	59·0	14·8	11·5	4·9
1931	—	6	5	9	7	1	—	**28**	—	21·4	17·9	32·1	25·0	3·6
1932	—	6	33	26	9	2	—	**76**	—	7·9	43·4	34·2	11·9	2·6
1933	8	12	100	28	14	5	—	**167**	4·7	7·2	59·9	16·8	8·4	3·0
1934	7	23	87	35	16	7	—	**175**	4·0	13·2	49·7	20·0	9·1	4·0
1935	7	36	83	38	18	6	—	**188**	3·7	19·1	44·2	20·2	9·6	3·2

Explanation of Table 29.

The figures appearing in this table are derived from the statistics contained in Table 28 in the following manner:—

1. Tornio. Each weight-class is converted into age-groups by assuming that the salmon, according to its smolt-age, is divided into 2% two-year-olds, 68% three-year-olds and 30% older salmon (four and five-year-olds). Salmon which had spawned previously are assumed to constitute 3% of the total catch of each year; their number, if similarly divided into the percentages on the basis of their assumed smolt-age, is taken from the third weight-class and transferred to the next but one age-group. (It is assumed, therefore, that the salmon do not ascend the rivers during the year immediately following the spawning year, but a year later).

2. Kemi. The conversion into age-groups of salmon belonging to different weight-classes is made by assuming the smolt-age to be two years in 9% of the total, three years in 78% and four (or five) years in 13%. Salmon which spawned in previous years are calculated at 6% of the total annual catch of salmon. These salmon — divided into the above percentages on the basis of the assumed smolt-age — are taken from the third (7·5—13 kg.) and fourth (13·5—19 kg.) weight-classes and transferred into the next but one age-groups. The transfer is made by taking $^3/_4$ of the quantity to be transferred from the third, and $^1/_4$ from the fourth, weight-class.

3. Simo. The conversion of the statistics contained in Table 28 into age-groups has been made by employing the same ratios as those used in converting the Kemi statistics, except for the fact that the quantity of salmon which had spawned in previous years is calculated to be only 3% of the total.

4. Ii and Haukipudas. In making the conversion, the smolt-age has been estimated at two years in 9%, three years in 78% and four (or more) years in 13%, i. e., on the same basis as that used for the Kemi and Simo statistics. As the statistics embrace comparatively small numbers the assumption in respect of salmon which spawned in previous years might be disregarded.

5. Oulu. In making the conversion the smolt-age has been estimated at two years in 15%, three years in 75% and four years in 10%. Salmon which had spawned in previous years have been estimated at 5% of the total. On this basis $^3/_4$ of the salmon to be transferred to older age-groups were taken from the third, and $^1/_4$ from the fourth, weight-class.

6. Bothnian Bay salmon region. The information from the Tornio, Kemi, Simo, Ii, Haukipudas and Oulu River regions in Table 28 has been combined and the conversion made by assuming the following division of smolt-age:— two years in 9%, three years in 75%, and older salmon in 16%. It has been assumed that there were no salmon which had spawned in previous years.

7. Kokemäki. The weight-classes in Table 28 have been converted by assuming the smolt-age to be two years in 86%, and three years in 14%. The salmon which had spawned previously have been calculated for the years 1921—25 and 1932—35 at 10% of the total number of salmon; for the years 1926—31 at 15%. Of the estimated number of salmon which had spawned previously $^3/_4$ have been transferred from the third weight-class — divided into proportions according to smolt-age — and the remainder — divided in the same ratios — from the fourth weight-class.

8. Kymi. In making the conversion the smolt-age has been assumed at two years in 88% and at three years in 12%. Of the total amount 10% has been transferred — as salmon of earlier spawning years — to the higher age-groups in a manner similar to that described above.

4	5	6	7	8+	5-8		3-	4	5	6	7	8+	5-8
			Number						Percentage				
											Kymi River.		
163	135	38	44	18	2	596	32·9	27·3	22·7	6·4	7·4	3·0	0·3
450	412	53	77	36	3	1149	10·3	39·2	35·8	4·6	6·7	3·1	0·3
282	549	87	70	31	4	1038	1·4	27·2	52·9	8·4	6·7	3·0	0·4
152	314	77	46	19	2	621	1·8	24·5	50·6	12·4	7·4	3·0	0·3
98	223	64	39	15	2	518	14·9	18·9	43·0	12·4	7·5	2·9	0·4
389	132	15	50	23	2	725	15·7	53·6	18·2	2·1	6·9	3·2	0·3
373	297	33	60	20	1	813	3·6	45·9	36·5	4·0	7·4	2·5	0·1
228	242	43	42	18	2	598	3·5	38·3	40·6	7·2	7·1	3·0	0·3
129	204	41	31	13	1	423	3·1	38·4	39·2	9·7	7·5	3·1	0·2
16	170	34	19	9	1	261	4·6	6·1	65·1	13·0	7·3	3·5	0·4
178	93	33	32	13	1	431	18·8	41·3	21·6	7·7	7·4	3·0	0·2
294	173	28	40	18	2	585	5·1	50·3	29·6	4·8	6·8	3·1	0·3
11	51	15	17	6		119	0·8	9·3	51·3	19·3	14·3	5·0	—
29	124	43	20	8	1	247	4·9	15·8	50·2	17·4	8·1	3·2	0·4
47	110	58	24	9	1	269	7·4	17·5	40·9	21·6	8·9	3·3	0·4

IV. Surveys and Summaries.

1. The Importance of different Year-Classes in Baltic Salmon Fishing during 1921—35.

The proportion of certain year-classes in the catches of salmon from the Baltic area varies to such an extent that a more detailed explanation will probably be of value.

Year-Class 1927/28. As shown by Table 10, and as mentioned on page 16, the 1934-fishing season was extremely good, both in Finnish and Swedish waters. The abundant catches of this season are shown, for example, by the fact that no less than 6,229 scale specimens were received from the different fishing grounds of the Tornio, Kemi and Oulu Rivers. This number is almost twice that of the following year, three times that of 1931—33, and almost six times that of other years, 1925—1928. I must point out, however, according to the statistics given in the previous chapter, that no exceptionally large catches were obtained from the Simo fishing area in 1934, although these were considered to be quite good (according to special statistics, 5,274 specimens: Maksniemi area 1,897, Simo village area 2,044 and Kuivaniemi area 1,333 specimens; see Tables 4 and 28 A).

An analysis of the specimen scales shows that *this good year 1934 was due principally to the 1927/28 year-class*, which at the time was more or less in the 3.3(+) life-cycle stage, a stage that amounted to 750 specimens among those sent from the Tornio River, 1,513 among Kemi and Valkeakari, 747 specimens among the Oulu River specimens — a total of 3,010 specimens, i. e. 48·3%.

This year-class was also present at other life-cycle stages, principally as 4.2+, but also as 5.1+ and 2.4+. The former — the 4.2+ life-cycle class — was represented from the Tornio River by 346 specimens, Kemi (and Valkeakari) by 165 specimens and the Oulu River by 9 specimens — a total of 520; the latter two by 49 + 3 specimens from the Tornio River collection, 9 + 16 from that of the Kemi, and 1 + 16 from the Oulu collection — a total of 94 specimens, corresponding to 9·9% of the total scale specimens. A few representatives of this same year-class were present among the re-ascending salmon, thus 19 in the Tornio River, 17 in the Kemi River and 12 in the Oulu River. More than half of the specimen scales of 1934 (3,672) — 59·0% — were representatives of the 1927/28 year-class.

The *following major groups* in the 1934 catches were salmon of the following year-class — 1928/29. 748 specimens in the Tornio River (majority in the life-cycle class 3.2+); 405 in the Kemi area (majority 3.2+); and 186 in the Oulu River (both 2.3+ and 3.2+); this represents a total of 1,339 specimens of the 1928/29 year-class, or 21·4% of the 1934 specimens.

The year-classes 1926/27 and 1929/30, the former as eldest, and the latter as youngest (grilse), are represented fairly uniformly in the 1934 specimens, by 436 of the former and 448 of the latter; combined they represent 10·9. The remainder of the 1934 specimens, i. e. 8·6%, is made up of representatives of other year-classes.

The year-class that played such an important part (58·9%) in the large catches of 1934 was represented among the catches of the *preceding* and *subsequent* years — 1933 and 1935 — as follows, according to scale specimens.

The 1927/28 year-class predominated in both the Tornio River and Kemi area specimens in 1933. Its percentage from the Tornio River was 51·4 (542 out of 1,055), and in the Kemi area no less than 61·5

(948 out of 1,542). Judging from the Oulu River specimens, this year-class appeared as a supplementary group in 1933, amounting to 27·1% (275 out of 1,014 specimens).

The 1927/28 year-class had already lost its importance in the 1935 catches. It was represented in the Tornio River by 10·1% (90 specimens), Kemi area by 16% (272 specimens) and Oulu River by 13·3% (144 specimens).

This year-class is thus represented in the 1933—35 specimens by 5,895 specimens (1933 1,765, 1934 3,624 and 1935 506). As the total number of specimens collected during this period was 11,494, *the 1927/28 year-class represented 51·3% of all three catch-years.*

The 1927/28 year-class, the majority of which in the spring of 1934 belonged to the 3.3 life-cycle class, had belonged two years previously (spring 1932) to the 3.1 life-cycle class. This fact caused me to evolve the following.

From Table 10 we note the fact — described in detail on page 21 — that in the southern Baltic yield of salmon the year 1932 was the last maximum year noted with a total catch of 833 tons. There is probably reason to suppose that a considerable part of that catch was composed of weighty salmon. The Polish statistics (see Table 9) nevertheless show that in 1932 there were also large quantities of mielnica, i. e., salmon in the A.1 life-cycle class. The quantity of mielnica caught in Poland that year was very large — 50,000. A study of the table shows that afterwards their number fell sharply, being still about 30,000 in 1933, but decreasing to some 7—7·5 thousand in 1934 and 1935.

The age of smolt obtained in 1932 in Polish and German waters is not known, but to my mind it is probable that three years has predominated. If this was the case, then the 1927/28 year-class that played such an important part in the catches of salmon in northern Finnish and Swedish waters during 1933 and 1934, has also constituted the major part of the catch of mielnica in the southern areas of the Baltic in 1932. Correspondingly the poor mielnica years in the Polish waters in 1934 and 1935 should indicate poor catches of salmon in the Bothnian Bay area. As far as Finland is concerned, at least, such forecasts have been completely realized especially in 1937, which fact should be mentioned here as preliminary information.

The Year-Classes 1914/15 and 1915/16. Table 10 shows that the years 1921/22 were very good salmon years in the Gulf of Bothnia and the Bothnian Bay. I have specimen scales from the Oulu and Kymi Rivers only for this period, but these specimens are so few that it is impossible to use them as a basis for any definite conclusion. The only source of information (apart from those shown in Tables 1 and 10) from the Finnish side are the special statistics in Tables 3 and 4. The good catches of these years are shown by the following figures (a) salmon caught in the Tornio area: 3981 in 1921, 4020 in 1922, but in 1923 only 2037, (b) Kemi area: 5559 in 1921, 3350 in 1922, but in 1923 only 1980 fish.

If we assume that the year-classes forming the 1921/22 catches have joined the same life-cycle class in the Bothnian Bay as the representatives of the 1927/28 year-class in 1933 and 1934, the salmon of that time have then belonged to the 1914/15 and 1915/16 year-classes; they have been in the mielnica stage in the springs of 1919 and 1920.

Year-Class 1920/21. The abundance of this year-class is shown first of all by the statistics according to weight-classes, given in Table 28 and, after a conversion into age and year-classes, in Table 29. The year-class 1920/21 then shows an individual quantity of almost 14,000, i. e., a greater quantity than that of any other year-class recorded in these tables (also nearly 2,000 more than the 1927/28 year-class, the abundance and special position of which have already been proved by the scale specimens). The great importance of the 1920/21 year-class in the formation of the catch is shown in particular by the catches of 1926 and 1927 in the Simo area (Maksniemi, Simoniemi and Kuivaniemi), and the Ii and Haukipudas waters.

This year-class also shows an obvious improvement on its predecessor in the Oulu River samples. It has been represented by 784 fish among the specimens from that river; of these 541 were caught in 1927, representing 79·7%, and 94 in 1926, but even then representing 36·3%, as the preceding year-class (1919/20) was weakly represented (32·6% only). The 1928 specimens still contained 110 fish belonging to the 1920/21 year-class, representing about 28%.

My specimens from the Kemi River for 1926 and 1927 were very few — owing to the failure of the fishing at the Korva weir — consisting of 220 and 171 specimens respectively — but of these 41·4% and 50·9% belonged to the 1920/21 year-class. No specimens were collected from the Tornio River at this time.

I will add, finally, that the principal life-cycle class of the 1920/21 year-class (3.3+) made its ascent in the summer of 1927, when the 1927/28 year-class was born; these two abundant year-classes — 1920/21 and 1927/28 — are thus closely connected, the latter extensively originating from the former one.

Year-Classes 1928/29 and 1929/30. The 1928/29 year-class may also be considered as being fairly abundant, as a total of 3364 representatives were traced in the specimens from the Bothnian Bay salmon area. This exceeds any other year-class with the exception of 1927/28.

We have already discussed the importance of the 1928/29 year-class (as a supplementary group) in the 1934-catches on page 89. Salmon of this year-class were represented in the 1934-specimens from the Tornio, Kemi and Oulu River regions by a total of 1559 fish — 21·4%. It is true that this percentage is

not very high, but it must be remembered that 1934 was the year when the 1927/28 year-class was in its actual ascending cycle, and thus predominated to a considerable extent — 58·9% of the catch.

In 1935 the 1928/29 year-class was represented in the specimens from the Bothnian Bay area by a total of 1645 salmon: Tornio River 243, or 27·4%, Kemi area 920, or 54·3%, and Oulu River 482, or 44·5%. The percentages show that salmon of this year-class did not attain the position in 1935 in the Tornio River that was expected; the percentage remained far too low. This has been brought about by the salmon belonging to the next two year-classes — 1929/30 and 1930/31 — which combined formed the majority — according to the scale specimens — of the total number of salmon ascending the Tornio River in 1935, i. e., 61·1% (23·9 + 37·2%), or 542 fish (212 + 330).

The older of these two year-classes, 1929/30, was represented in the 1935-specimens from the Kemi area by 436 fish, or 25·7%, Oulu River 337 fish, or 31·1%, while the younger year-class, 1930/31, in the same collection was represented as follows: from the Kemi area by 29 fish only, or 1·7%, and Oulu River by 62 fish, or 5·7%.

Year-Class 1917/18. The Polish statistics show that the number of mielnica caught in 1922 was exceptionally large — more than 100,000 fish. Assuming that they had mainly originated in the rivers flowing into the Bothnian Bay, the majority would have belonged to the 1917/18 year-class. Representatives of this class were in the life-cycle 3.3+ in the summer of 1924, i. e., they were in a stage which materially influences the abundance of the catch, as it would form at least half of it.

A general estimate of the 1924 catch shows this year-class to be average or slightly above average. My scale-specimens for this year are unfortunately so few in number that they are unable to shed further light on this question. The number provided by my weight-class statistics shows that the representation of the year-class is comparatively weak — 7290 (7466) specimens (only the figures for the two subsequent years are below this).

Year-Classes 1921/22, 1922/23 and 1923/24. The number of mielnica caught in Polish waters during the years 1926—28 was also large — more than 50,000 specimens (56,770 — 77,600). Assuming the smolt-age of these mielnica to be three years, they would have belonged to the 1921/22, 1922/23 and 1923/24 year-classes, i. e., the year-classes that more or less maintained the salmon fishing in the Bothnian Bay during the period 1928—30. The three years in question were marked by poor catches, particularly in 1929, during which year the catch, according to the general catch statistics (Table 10), was the smallest one for the whole period 1921 — 1935 — only 260 tons.

Under these circumstances the fact that the Baltic catch of salmon reached its peak in 1928 with 882,000 salmon deserves particular attention. There is no information which would act as a guide in determining the size and the year-class of the salmon then caught, but it is probable that the year-classes would correspond to the life-cycle classes as follows:—

1921/22	if the salmon were in the				.....	3.3+ class
1922/23	—	—	—	—	.....	2.3+ —
					or...	3.2+ —
1923/24	—	—	—	—	.....	2.2+ —
					or...	3.1+ —

My scale specimens from the Kemi area and Oulu River for 1928—30 provide the following illustration of the part played by these year-classes in forming the catch during the year in question which, as mentioned above, was a poor salmon season. Specimens collected from the Kemi area were 322 in 1928, 587 in 1929 and 594 in 1930; from the Oulu River: 394 in 1928, 317 in 1929 and 417 in 1930. (Specimens were not collected from the Tornio until 1930.) According to these specimens the last-mentioned year-class, i. e. 1923/24, was the one most weakly represented in the Bothnian Bay catches of salmon, as will be seen from the figures below:—

Year-Class	Total Catch (1928—30)	Kemi River	Oulu River
1921/22.....	715	398	317
1922/23.....	874	502	372
1923/24.....	486	262	224

The year-classes 1921/22 and 1922/23, have (according to the specimens) both reached the position of being more than 50% of the number that belongs to normal year-classes at that life-cycle, during their main ascending years, the former in 1928, and the latter in 1929. To be more exact, salmon belonging to the 1921/22 year-class amounted to 57·2% (184 specimens) of the 1928-specimens from the Kemi area, and to 54·3% (214 specimens) of those from the Oulu River. Individuals belonging to the 1922/23 year-class amounted to 54·3% (319 specimens) of the 1929-specimens from the Kemi area, and to 58·4% (185 specimens) from the Oulu River. On the other hand, individuals belonging to the 1923/24 year-class constituted only 33% (196 specimens) of the 1930-specimens from the Kemi area, and 39·1% (184 specimens) from the Oulu River. The shortage occasioned by this year-class in 1930 was made up partly by the preceding year-class (as in the previous case 1928 and 1929), but also to a considerable extent by the 1924/25 year-class beginning the new period of increase. If we rely on the Finnish and Swedish catch statistics (Gulf of Bothnia) for 1928—30, according to which the catch in 1929 was at its minimum, and on my scale investigations, *the 1923/24 year class was one of the most insignificant as regards abundance.* Or it might possibly be that the intensive

fishing to which this and the two previous year-classes had been subjected (for example, the large catches of mielnica of 1926—28 in Polish waters, and of 1927 and 1928 in the Baltic), has had such deleterious effect on the number of individuals in these year-classes, that the decrease in the catch observed in the Bothnian Bay is due to fishing elsewhere rather than to the original scarceness of individuals.

It may also be possible that the abundant catches of 1927 and 1928 in the Baltic are composed, at least in part, of salmon which have been hatched in rivers emptying into the Gulf of Finland. Salmon belonging to the 1921/22 year-class are very well represented among my specimens from the Kymi River, i. e. a total of 1113 specimens. Of these 411 are from 1926, 511 from 1927 and 103 from 1928. The 1922/23 year-class is represented in specimens from this river by 740 specimens, 217 being from 1927 and 320 from 1928. The 1923/24 year-class was represented by 542 specimens, of these 124 were from 1928 and 252 from 1929.

Year-Class 1916/17. There is very little to say of this year-class, as the scale collections of 1922—24 from the Kemi and Oulu Rivers have been far too few in number. The statistics of Table 27 when converted (Table 28) give this year-class 7,600—7,800 salmon, which amount can be considered as low or, at the utmost, moderate. The catch in the principal areas of the Baltic was fairly small in 1921, when the majority of individuals in this year-class were on their second summer migration, and moderate in 1922, when they had spent three summers on migration (490,000 kilo, Table 10).

Year-Classes 1918/19 and 1919/20. I will now take the year-classes which due to deficient abundance, were the principal reason for *the poor catches of 1925 and 1926* in the Gulf of Bothnia (incl. Bothnian Bay); the catch during the last-mentioned year *was particularly poor.*

Scale specimens collected in 1925 from the Kemi River area number 424, from the Oulu River 257. The 1918/19 year-class should have formed the principal part of the catch in that year, but it was very poorly represented in the Kemi River specimens, being only 84 specimens, or 19·8%. The greater part of the Kemi specimens were composed of two older year-classes — then over-age — the 1916/17 and 1917/18 year-classes, that combined amounted to 176 specimens, or 41·5%, which, of course, is exceptional and proves the deficiency of the 1918/19 year-class. The 1925-specimens from the Oulu River show a more normal relation; the 1918/19 year-class is represented by 113 specimens out of 257, corresponding to 44·0%, but the supplementary group was composed of the two older year-classes: a total of 89 specimens, or 35·6 %.

Scale specimens collected from the Kemi area in 1926 amounted to 220, from the Oulu River to 259. The 1919/20 year-class is poorly represented in both collections, seeing that according to its age it should amount to more than 50%. It is represented in the 1926 Kemi area specimens by only 30·0% (66 specimens), and in the Oulu River specimens by 33·6% (87 specimens). The predominant position of the two older year-classes (1918/19 and 1917/18) — the latter in particular being very scarce — was taken by the still young, but one of the most prolific, year-class 1920/21 which has already been discussed. (The two older year-classes were represented in 1926 by 13·2% only in the Kemi area, and 18·5% in the Oulu River specimens.) The representation of members of the year-class 1920/21 in the 1926 specimens was 41·4% (91 specimens) as regards the Kemi area, and 36·3% (94 specimens) from the Oulu River.

Year-Classes 1924/25, 1925/26 and 1926/27. The catch of salmon during the years 1931—33 from the Gulf of Bothnia (incl. Bothnian Bay) taken as a whole should probably be considered as moderate. The predominant position, as regards the fishing in the Bothnian Bay, was occupied by the 1924/25 year-class in 1931, the 1925/26 year-class in 1932, and the 1926/27 year-class in 1933. Both the first-mentioned year-classes have reached a normal status in the Tornio, Kemi and Oulu River areas during the above-mentioned ascending years, in so far as they represent about 50% of the catch. In this respect the 1926/27 year-class is in a different position. To be more precise, the proportion of the 1924/25 year-class in the 1931 catch (according to scale specimens) from the Tornio River was 458 specimens, or 44·4%, from the Kemi River (few scale specimens) 96 specimens, or 45·7%, and from the Oulu River 266 specimens or 55·2%. The 1925/26 year-class was represented in the 1932 scale specimens from the Tornio River by 138 specimens, or 27·7% (in other words fairly weak, but during the preceding year there were 370 specimens, representing 35·8%), from the Kemi area 449 specimens or 45·4%, and from the Oulu River 567 specimens, or 61·4%, a fairly large quantity. During this year (1932) the Oulu River was, for the first time over several years, the river yielding the largest numbers of salmon as regards the Finnish area of the Bothnian Bay. It is believed that the high waters of that year in the Kemi and Tornio Rivers had an adverse effect on the fishing. If this is true, it is probable that the abundance of the year-class was, nevertheless, the main determining factor.

The 1926/27 year-class did not — according to the scale specimens — achieve its rightful position in 1933, due to the abundant 1927/28 year-class. The proportion of the 1926/27 year-class in the 1933-specimens from the Tornio River was 16·2% only (171 specimens), from the Kemi area 25·3% (390 specimens), and from the Oulu River 36·7% (372 specimens).

Altogether the year-classes 1924—1927 have been represented in the scale specimens collected from the Bothnian Bay salmon area by 1808, 2352 and 1901 fish.

The above explanation of the varying abundance of the year-classes has not taken into account specimens from the salmon rivers of southern Finland. To judge from the specimens obtained from the salmon waters of the **Kymi River**, the 1921 22 year-class has played the most important part among the salmon ascending that river since the year 1925, i. e., 1113 specimens. It has been followed by the individually abundant year-classes 1922 23 and 1923 24, there being 741 specimens from the former, and 543 from the latter. The year-classes 1924 25, and particularly 1925 26, are but weakly represented, — 224 and 112 specimens. Compared to these the year-classes 1926 27, 1927 28 and 1928 29 have been abundant, recording 479, 510 and 338 specimens respectively. The importance of the 1927 28 year class, which was particularly abundant in the Bothnian Bay, in the 1933 and 1934 catches of the southern Finnish salmon area is difficult to judge in detail from the scale specimens. This is due to the fact that during the years in question the eastern arm of the Kymi River was dammed for building operations, thus occasioning exceptional conditions as regards the height of the water and the yield from fishing. According to available information the salmon fishing in the sea at the estuary of the Kymi River was extremely good during these years.

With regard to year-classes ascending the Kymi River prior to 1925, my scale specimens are not sufficiently representative, as they were taken from a portion only of the catch. It appears nevertheless that the 1917 18 year-class was abundant here, being represented as "grilse" as early as 1921 by 25·3 % (83 out of 328 specimens), in 1922 as small salmon by 33·9 % (77 out of 227 specimens), in 1923 as large salmon by 80·4 % (119 out of 148 specimens), in 1924 by 31·2 % (45 out of 144 specimens), and even in 1925 by 25·1 % (89 out of 355 specimens). This represents a total of 413 specimens out of 1202, and corresponds to 34·4 % over a period of 5 years. The following year-classes — 1918 19, 1919 20 and 1920 21 — appear to have been but weakly represented in the Kymi River, the scale specimens amounting to only 187, 151 and 244, although collections were made during the period 1924—1928, when specimens were taken from practically every salmon caught, at most collecting stations, although not from every one.

The material from the **Kokemäki River** is fairly small, and consequently not very illustrating. From the point of view of greatest individual abundance the 1919 20, 1920 21 and 1922 23 year-classes appear to occupy the leading positions. The total representation of these year-classes in the material has been 260, 293 and 176 specimens. The 1925 26 and 1926 27 year-classes are very insignificantly represented, both by less than 50 specimens. The year-classes 1927/28, 1928/29 and 1929/30 have been more abundant. No collection of scale specimens was made during the most important year of ascent of the first-named year-class into the Kokemäki River (1933), but the total catch that year rose from the 76 specimens of the previous year (1932) to 167 specimens. The 1928/29 and 1929/30 year-classes were represented in the 1934 and 1935 catches — which totalled 363 specimens — by 42·1 % (154 specimens) and 31·7 % (115 specimens).

Starting from (a) the catch statistics of the years 1921—35 for the different countries interested in Baltic fishing, (b) the results of my scale collections, and (c) in special cases the statistics from the Finnish coasts divided into weight-classes, I have endeavoured to estimate the importance of these different year-classes in Baltic salmon fishing. The result can be given as follows, divided into three main groups only as this is but an attempt to give the main features:

A: Superior year-classes:
1914 15, 1915 16, 1920 21, 1927 28, and, perhaps, 1928 29.

B: Moderate year-classes:
1916 17, 1917 18 (possibly midway between A. and B.), 1921 22, 1922 23, 1924 25, 1925 26 and 1926 27.

C: Poor year-classes:
1918 19, 1919 20 and 1923 24.

2. Factors influencing the Abundance of the Year-Classes.

In the preceding chapter I have endeavoured to estimate the relative abundance of the year-classes hatched during the period 1914—1929 — although from a general point of view only. Having grouped the year-classes into three different classes on this basis I will attempt in the following to discuss the conditions under which these year-classes have been hatched, and which have influenced their varying abundance. The main factors in this have been the conditions prevailing during the spawning and the subsequent period when the fertilised spawn has been motionless in the bed of the river, developing into fry. As this stage is of long duration — the whole of the winter — external conditions have obviously fluctuated. In cases where an unsuccessful year-class has occurred despite apparently favourable external conditions, the failure may be ascribed to the fact that the number of spawning pairs was insufficient in the river.

As the ascent of the salmon, particularly as regards rivers of the Bothnian Bay, appears to be affected by the high water during the early spring floods, permitting large numbers of salmon to pass the lower reaches of the river without being caught (due to fishing difficulties), the result is that in such years larger numbers of salmon reach the headwaters of the river than is the case with weak spring floods. The strength and the volume of the spring floods thus influencing the number of spawning individuals in the headwaters of the river, I am recording below the high-water mark of the spring floods in the Tornio,

Kemi and Oulu Rivers during 1914—28, divided into three (rather indefinite) groups — high, medium and low:

Tornio River:

high		medium		low	
1917	359 cm.	1924	288 cm.	**1915**	262 cm.
1920	351 cm.	1919	277 cm.	1916	259 cm.
1927	320 cm.	1925	276 cm.	1918	235 cm.
1923	296 cm.	1921	270 cm.	**1914**	233 cm.
1922	290 cm.	1926	268 cm.		
		1928	266 cm.		

Kemi River:

high		medium		low	
1922	760 cm.	**1914**	550 cm.	1919	492 cm.
1918	738 cm.	1925	538 cm.	1926	492 cm.
1924	688 cm.	1921	536 cm.	**1916**	464 cm.
1917	680 cm.			**1915**	436 cm.
1920	628 cm.			**1928**	388 cm.
1923	625 cm.				
1927	616 cm.				

Oulu River:

high		medium		low	
1920	379 cm.	1923	275 cm.	1925	226 cm.
1924	379 cm.	1921	249 cm.	1928	217 cm.
1922	302 cm.	**1914**	236 cm.	1918	211 cm.
1926	302 cm.	1917	233 cm.	1916	202 cm.
1927	302 cm.			**1915**	184 cm.
1919	301 cm.				

I should perhaps draw attention to the fact that the four springs (1914, 1915, 1920, 1927), when ascending salmon form the parents of the year-classes which have proved to be abundant (1914/15, 1915/16, 1920/21 and 1927/28), have differed as regards flood conditions. In all three rivers the floods have been high in the springs of 1920 and 1927, low in 1915, but in the spring of 1914 medium in the Kemi and Oulu Rivers, but low in the Tornio River (lowest in that river for the whole period 1914—28).

The water-level conditions of late autumn and winter which, as regards the renewing of the stock of salmon, are probably of superior importance, are given for the Tornio and Kemi Rivers according to daily observations made above Kukkolankoski Rapids — the lowest rapids in the Tornio River — and below the Taivalkoski Rapids — the lowest rapids in the Kemi River. The observations as regards the Oulu River have been made below the Pyhäkoski Rapids. These rapids are situated about half way up the river and have a length of 20 km. and a fall of 56 m.

I have taken the level of the water during the spawning season as my starting point. I have been unable definitely to fix the spawning period, as it varies to some extent every year. Nevertheless, I think that I have been more or less correct in assuming that the most usual spawning period in the Kemi and Tornio Rivers happens between 5th and 10th October, and in the Oulu River about the 20th October.

From the geographical peculiarities of these rivers alone, it can be concluded that they vary as to importance as salmon spawning rivers. As a river the Oulu River is comparatively short and with concentrated rapid waters, although certain rapids are of considerable length. Before all, however, the extensive lake waters of its upper reaches have a balancing effect on the level of the water and bring about the peculiarity of this river, i. e., the fact that the spawn of the salmon is more protected here than in other rivers. Subject to sufficient numbers of spawning salmon and the productivity of the river being sufficient to maintain the number of parr, this river can be considered one of the main rivers as regards the maintenance of the stock of salmon in the Baltic Sea. It can therefore be considered a great disadvantage that in the very near future the Pyhäkoski Rapids will be dammed for a new power station. As regards the maintenance of the stock of salmon, the Tornio River is unfavourable owing to lack of lakes to stabilise the level of the water and to rainfall being fairly small. The water level of the Kemi River is influenced to some extent by the Kemi Lake, by the extensive rainfall area and by the fairly gentle slope as compared to the Tornio River.

I will first present my survey of the water-level conditions in the above-mentioned rivers during the period 1914—1929 as a general summary, and then in detail. Both surveys are divided into winter periods during which the superior year-classes have been hatched, into winters when more or less moderate year-classes have been hatched, and finally into winters during which weak year-classes have originated.

I. General Survey.

A. Superior Year-Classes.

River	**1914/15**
Oulu	extremely good; the water has fallen on two occasions only: 5—11 cm.
Kemi	probably good, although the level of the water was low in November—December (In Taivalkoski Rapids as much as 70 cm. lower).
Tornio	difficult to estimate, but probably better in the upper reaches than in the Kukkola Rapids area.
	1915/16
Oulu	extremely good; water fallen by only a few cm. (maximum 8 cm.).
Kemi	good; water fallen once in end of October, maximum 30 cm.
Tornio	apparently good; fall in water at Kukkola Rapids also less than during most winters (maximum 20th April — 35 cm.).

1920/21

Oulu extremely good; water fallen only once in October, maximum 10cm.

Kemi December period uncertain (water low, maximum 100cm.); later conditions would have been good.

Tornio uncertain; during winter water 40—51cm. lower.

1927/28

Oulu perhaps good or fair, although on one occasion at the end of March the water fell by as much as 32cm.

Kemi good, if the low water periods of October and November (former 55cm. and latter 30cm. fall) had not caused difficulties.

Tornio uncertain; water considerably lower at Kukkola Rapids during the winter. Conditions in upper reaches apparently more favourable.

1928/29

Oulu extremely good; water fallen maximum of 11 cm.

Kemi extremely good; water not fallen at all below level of spawning period.

Tornio beginning of winter good, end of April and beginning of May uncertain (considerable fall in level of water, even up to 60cm.).

B. Moderate Year-Classes.

River 1916/17

Oulu extremely good; water fallen below level of spawning period in November only — 11 cm.

Kemi good; water fell only in October and November, maximum 24cm.

Tornio under circumstances good (maximum fall in Kukkola Rapids 38cm.).

1917/18

Oulu up to middle of May good, subsequently water fell as much as 43cm.

Kemi good except in November, when fall was as much as 77cm.

Tornio uncertain; during winter months water also 56—66cm. lower.

1921/22

Oulu bad; water 47—63cm. lower in April.

Kemi unfavourable at end of October and beginning of November — water finally fallen by 68cm. — at other periods water level favourable.

Tornio uncertain; water 56—63cm. lower at Kukkola Rapids in February—April.

1922/23

Oulu apparently fairly good, although water 27cm. lower at beginning of May.

Kemi probably good, in spite of low water on 6th March (40cm. lower).

Tornio probably bad; water low during winter months, February—March 50—58cm. lower.

1924/25

Oulu good; water lower on only a few occasions and very slight — maximum 18cm. (March).

Kemi probably not very good, depending on the importance of the fact that in both November and December the water fell 47 and 49cm. below the level of the spawning time.

Tornio also questionable; water low in February, March and April — 35—52cm. lower.

1925/26

Oulu good, water higher.

Kemi good, only a fall of 14—28cm.

Tornio uncertain, but probably — according to observations made at Kukkola Rapids — rather bad. During winter period water often lower by 66—76cm.

1926/27

Oulu good; water lower on only one occasion, 14 cm.

Kemi probably rather bad; water 38cm. lower in March and 60cm. lower at end of April.

Tornio uncertain; water 41—53cm. lower in March, April and May.

C. Poor Year-Classes.

River 1918/19

Oulu good; water fallen only once — 4cm.

Kemi probably bad; water from end of November till 9th December 87—118cm. below level of spawning period.

Tornio probably bad; water at end of February 67cm., end of March 78cm. and middle of April 80cm. lower.

1919/20

Oulu good; maximum fall of 22cm.

Kemi bad; water at end of October 90cm., March 42—65cm. and April 40—50cm. lower.

Tornio bad; water during beginning of November 90cm., January, February and March 103—105cm. lower.

1923/24

Oulu probably weak or at least uncertain; fall of 41cm. at end of April.

Kemi probably bad; low water in March, April and May 60—79cm. lower.

Tornio also bad; low water in April and May 93—95cm. lower.

II. Detailed Survey.

A. Superior Year-Classes.

River 1914/15

Oulu October 5th—20th: height 101—98cm. Water *remained* above 100-cm. level *the whole winter* except at the end of October and middle of

November, when the water fell from 5 cm. and 11 cm.; the latter low water lasted for one day only.

Kemi October 5th—20th: height 178—150 cm. Level of water during spawning period can be estimated at 160 cm. Water gradually fell to 90 cm. (November 7th), corresponding to a fall of 70 cm. Water rose on December 12th above the 160-cm. level and *remained above this level the whole winter* (even at low water the level kept above 190 cm.).

Tornio October 5th—20th: height 108—89 cm. We can thus assume that the level of the water at Kukkola Rapids was about 100 cm. during the spawning. But as the water level fell quickly, being 41 cm. on October 31st, and only 15—22 cm. on November 6th—9th, it is probable that a relatively lower level prevailed in the upper reaches of the river even during the spawning. On one occasion only during the winter (December 14th—15th) did the water rise to above the 100-cm. level, otherwise it remained between 83 and 53 cm., falling at the end of March and beginning of April to 43—46 cm. height. The level of the water during the winter — as far as the Kukkola Rapids are concerned — was therefore continuously 17—57 cm. lower than the level of the spawning period.

1915/16

Oulu October 5th—20th: height 80—65 cm., but the water continued to fall, reaching its minimum — 61 cm. — on the 26th. If we assume the level of the water to have been 65 cm. during the spawning period, *the low water fell by only a few centimetres (maximum 8 cm.) below that level* during the middle of April.

Kemi October 5th—20th: level 126—138 cm. The low water fell by 30 cm., i. e. to 108 cm., at the end of October, but *remained* from November 4th *above the 138-cm. level throughout the winter* (it was generally considerably above this level, i. e. 40—112 cm., if we take the low water of each month separately).

Tornio October 5th—20th: height 72—62 cm. The water fell considerably at the end of the month, reaching its lowest point — possibly owing to the packing of the ice — on November 3rd, 22 cm., but rising again to above 72 cm. on the 26th, only to fall once more below this level on December 18th. During January, February and March the water remained at 46—59 cm., or 27—14 cm. below the 73 cm.-level; in April it fell 35 cm. below this level (20th April). Conditions in the upper reaches of the river were probably favourable as in the autumn of 1914. This can be assumed from the falling of the level in the Kukkola Rapids during the latter half of October.

1920/21

Oulu October 5th—20th: height 103—98 cm., falling from this level by 10 cm. on October 22nd, thus being 88 cm. The water was *above this level during the whole winter*, and dating from November 11th, above the 100-cm. level.

Kemi October 5th—20th: height 225—172 cm., falling to 132 cm. on November 9th. The level of the water during the spawning period should probably be assumed at about 200 cm. The water remained below this level up to January 19th, being low particularly in December — only 144—100 cm. (maximum difference thus a whole metre). Dating from January 19th the level of the water was above 200 cm., except at the end of March and beginning of April, when the low water fell some 7 cm.

Tornio October 5th—20th: height 112—93 cm., the level falling to 73 cm. on the 28th. If the level of the water during the spawning period is taken as 100 cm., the level of the water during the whole of the winter — excluding the high water of December — was below this level; the low water as follows: November 50 cm., December 33 cm., January 24 cm., February 43 cm., March 44 cm. and April 51 cm.

1927/28

Oulu October 5th—20th: height 148—129 cm., falling after this by 18 cm. (28th). If the spawning occurred while the level of the water was 130 cm., the level has then fallen below this by 18 cm. in October and by the end of February, while during March it was as much as 32 cm. below. The rise began again on April 4th, without reaching the 130-cm. level before April 25th.

Kemi October 5th—10th: height 194—232 cm. (October maximum), on 11th—20th 230—178 cm. If the spawning had occurred while the water was at the 230-cm. level, the water would not have fallen by more than 55 cm. in October, and by 30 cm. in November (1st), and by 10 cm. only in March—April.

Tornio October 5th—10th: height 116—150 cm., 11th—17th: 152—105 cm., and 18th—27th: 97—46 cm. During the period subsequent to the spawning a powerful fall of about one metre thus occurred in the Kukkola Rapids, which presupposes that the water in the upper parts of the river was at a comparatively low level during the spawning. The high water only exceeded the 100-cm. level in January and December, the level at other periods being between 48 and 89 cm., in other words still a metre lower than the level of October 11th.

1928/29

Oulu October 5th—20th: height 126—112 cm.; if the spawning has occurred at this time the level of the water has been *more than 126 cm. the whole of the winter*, except during May, when on one occasion (5th) it fell by 11 cm., i. e. to 115 cm.

Kemi October 5th—24th: height 173—124 cm., but rose from November 5th (on that date 130 cm. height). If the spawning occurred while the level was 125—130 cm., *the water was above this level the whole of*

the winter (lowest water at end of April and beginning of May — 150cm.).

Tornio October 5th—20th: height 104—35cm. If the spawning occurred while the level of the water was 80cm., the water must have fallen in October (18th) by 35cm., i. e. to 55cm., but subsequently to 14cm. below 80cm. by the beginning of March, and in April/May by as much as 60cm., i. e. to 20cm.

B. Moderate Year-Classes.

River

1916/17

Oulu October 5th—20th: height 49—73cm. If we assume the level of the water at the spawning period to have been 70cm., the water level only fell at the beginning of November by 11cm., at all other periods during the winter it remained above this level.

Kemi October 5th—20th: height 138—100cm. If we assume the level of the water during the spawning to have been 120cm., *this level was kept throughout the winter*, with the exception of the end of October and the beginning of November (when it was 24cm. lower).

Tornio October 5th—20th: height 56—24cm. If the level of the water during the spawning is taken to have been 50cm., the water fell below this level in October by 26cm., February and March by 4cm., the end of April by 19—22cm., and the beginning of May by 38cm.

1917/18

Oulu October 5th—20th: height 127—167cm., rising by 17cm. to 184cm. on the 26th. If the spawning occurred at a level of 170cm., the water only fell below this level at the end of April, by 6cm., but the fall continued into the middle of May, when the water reached its lowest level on the 13th, being 43cm. lower, or at the 121-cm. level.

Kemi October 5th—20th: height 292—362cm., rising subsequently to as much as 442cm. (28th). If the level during the spawning is estimated at, for example, 310cm., the water remained at this level except on November 19th—26th when it fell a maximum of 77cm. (25th).

Tornio October 5th—20th: height 125—156cm., rising towards the end of the month to 190cm. (29th). The level of the water during the spawning may have been about 140cm. The level of the water fell below 140cm. in November 10cm., in December 13cm., in January 48cm., in February 56cm., and at the end of March and April 65—66cm.

1921/22

Oulu October 5th—20th: height of water 125—201cm. If the spawning occurred while the level of the water was 200cm., the water had fallen at the end of October by 20cm., but risen on the 31st of the month to over 200cm. The water fell again on February 28th to 197cm., but continued to fall up to the end of March, being 153cm. on the 31st, and only 137cm., or 63cm. lower, by the middle of April.

Kemi October 5th—20th: height of water between 248—272cm., except on 15th and 16th, when it was 286cm. If the spawning occurred when the level of the water was 250cm., the water fell below this level by the end of October and beginning of November only by 68cm., i. e. to 182cm.

Tornio October 5th—20th: height 128—148cm., subsequently falling rapidly to 79cm. (28th). If the spawning occurred when the level was 130cm., the low water has been considerably lower than this during every winter month: October 51cm., November 30—35cm., December 15cm., January (end) 36cm., February 56cm., and March—April 62—63cm.

1922/23

Oulu October 5th—20th: height 136—122cm., from which the water fell by 13cm. (28th). The level of the water during the spawning was probably about 120cm. With the exception of October 11th the water only fell below this level after March 17th, being 9cm. lower on the 31st, but 27cm. lower at the end of April and the beginning of May.

Kemi October 5th—20th: height of water 134—161cm., rising on 22nd to 165cm. but falling on November 6th to 100cm. Level of water during spawning probably 140cm. Under these circumstances the water was above this level for the whole of the winter with the exception of November 6th (40cm. lower). Low waters during March, April and May 150—160cm. height.

Tornio October 5th—20th: height 127—105cm., from which level it fell by November 6th by 40cm., or to 65cm. The level of the water during the spawning may be estimated at 120cm. Water remained lower for the whole of the winter with one exception (in December); the lowest waters recorded: October 41cm., November 30—55cm., (longer low-water period 29.X.—27.XI.), December 24cm., January 35cm., February 50cm., March 58cm., end of April and beginning of May 68—69cm., below 120cm. In general water at low level for the whole winter beginning January 1st (94cm.) and ending May 1st—7th (51cm.).

1924/25

Oulu October 5th—20th: height 102—97cm., about 100cm. during spawning. Low waters below this level: October 6cm., November 18cm., February March and April 3—8cm.

Kemi October 5th—20th: height 202—188cm.; during spawning probably 200cm. Under these circumstances the lowest water would have fallen below this level in November by 47cm., December 49cm., but at other periods, i. e. middle of winter, somewhat higher (200—242cm.).

Tornio October 5th—20th: height 124—150cm. Estimated at 124cm. during spawning. Low water falling as

follows: November 12 cm., December 24 cm., January 28 cm., February 35 cm., March and April 52 cm. lower (even high water in March 36 cm. lower).

1925/26

Oulu October 5th—20th: height 71—64 cm. Level during spawning 64 cm. Subsequently *the water was above this level for the whole of the winter* by a minimum of 54 cm. and a maximum of 83 cm.

Kemi October 5th—20th: height 184—140 cm., from which level the water then fell by 8 cm. (25th). If the level during the spawning was 160 cm., the level has been below this by 28 cm. in October/November, and by 14 cm. in March/April.

Tornio October 5th—20th: height 125—68 cm., from which level water fell to 43 cm. on 23rd. Level of water during spawning possibly 120 cm., but farther up the river relatively lower, as it has been followed by a fall of 76 cm. Water had been considerably lower during the whole of the winter — except high water in December. Low-water seasons as follows: October 76 cm., November 66 cm., December 22 cm., January 53 cm., February 63 cm., March and April 66 cm.

1926/27

Oulu October 5th—20th: height 106—120 cm. Level during spawning can be estimated at 115 cm. The water did not fall below this level except on October 30th, by 14 cm. At all other periods the water was as much as 102 cm. above and at least 9 cm. higher, i. e. 124 cm. (25th April).

Kemi October 5th—20th: height 172—246 cm. Level during spawning about 180 cm. (9th). Water fallen below this in October (28th) by 40 cm., and then only at the end of March by 38 cm. and at the end of April by 60 cm.

Tornio October 5th—20th: height 104—172 cm. (172 cm. on 16th). Level during spawning estimated at about 105 cm. The low-water seasons during the winter have been below this level as follows: October 15 cm., November 34 cm., January 23 cm., February 27 cm., March 41 cm., April and May 49—53 cm.

C. Poor Year-Classes.

River

1918/19

Oulu October 5th—20th: height 140—150 cm., rising at the end of the month by 10 cm. Water fallen below 150 cm. *only once in April and then by only 4 cm. (13th).*

Kemi October 5th—20th: height 182—268 cm., and rose by a further 7 cm., i. e. to 275 cm., on 22nd. If level during spawning is assumed to have been 230 cm., the water fell below this level on November 18th, 87 cm. on the 24th and no less than 118 cm. on December 6th below the level, i. e. at a height of 112 cm. Water was at 230 cm. or higher from December 9th to April 5th; below this during the middle of April, minimum height 218 cm.

Tornio October 5th—20th: height 148—135 cm. If the level was 140 cm., for example, during the spawning, *the high water during the whole of the winter was below this level*, with the exception of November 20th—22nd, and December 15th and 16th when it was 9 cm. higher, or at more or less the same level (142 cm.). The water fell in October by 35 cm., reaching the lowest point — 58 cm. — on November 26th. At the end of February it was 67 cm. lower, at the end of March 78 cm. lower, and during the middle of April 80 cm. lower, or at a height of 60 cm.

1919/20

Oulu October 5th—20th: height 129—166 cm. Level during spawning can be assumed at 150 cm. (20th); water thereafter was higher and fell to the same level only at the beginning of March, being below the level until April 4th, a maximum of 22 cm. (March 24th and 28th).

Kemi October 5th—14th: height 301—268 cm., after which a slight fall occurred to 190 cm. (31st). If the level during the spawning is estimated at 280 cm. (October 12th) the water subsequently fell by no less than 90 cm., rising to above 280 cm. only on November 11th. The water subsequently fell below this level in December by 10 cm., in January by 29 cm., February by 40 cm., being 42—65 cm. lower in March, and 52—40 cm. lower at the beginning of April.

Tornio October 5th—20th: height of water 170—120 cm. Fall continued up to November 3rd, when the level was only 81 cm. The spawning, if carried out on about the 5th, occurred during high water which was followed by a direct fall of 90 cm. *Even the high water during the winter did not on a single occasion approach that level* (on December 12th it was 123 cm., or 57 cm. lower; the highest water in January was 89 cm., in February 99 cm. lower). The low waters of January, February and March were 103—105 cm. lower, or at a level of 65—67 cm.

1923/24

Oulu October 5th—20th: height 165—198 cm., but continued to rise up to 242 cm. (26th). If the level during the spawning is estimated at 200 cm., the water fell below this level about the middle of March, a maximum of 26 cm., continued to fall up to the 30th of April, so that on the 29th and 30th the level was 159 cm., or 41 cm. lower.

Kemi October 5th—20th: height 278—288 cm., so that the level during the spawning was about 280 cm. The water fell below this level by a maximum of 45 cm. at the beginning of November, by a maximum of 30 cm. in February, 60 cm. in March (at the end), 79 cm. at the end of April, and 60 cm. during the first days of May.

Tornio October 5th—20th: height 190—152 cm. Level during spawning can be taken as 170 cm. Water fallen below this level in November by 63 cm., in December by 58 cm., January 54 cm., February 88 cm., end of March and beginning of April and May 93—95 cm.

A study of the above survey will show that even water conditions favourable to the hatching of the salmon occurred in all three rivers (Oulu, Kemi and Tornio Rivers) during the winter of 1915/16, when one year-class proving to be of high abundance was hatched. This was also the case with the Oulu River, and probably the Kemi River in the winter of 1914/15.

Water-level conditions during the winter of 1920/21 were favourable in the Oulu River only. There is no absolutely reliable information on the conditions in the Kemi River for this winter, but since it produced a fairly rich year-class it may be assumed that the great fall in the level of the water during December had no lasting effect. Another explanation may be, that high floods in all the rivers in the spring of 1920, brought the salmon in such numbers for the autumn spawning that the damage caused by the low water of December did not become disastrous.

The water-level conditions during the winter of 1927/28 were probably at their best in the Kemi River, while hardly at their best in the Oulu River. The great density of the year-class then developing can partly be explained by the fact that there were floods in all the rivers during the spring of 1927.

The water conditions in all three rivers in the winter of 1928/29 were superior to those of the previous year: they were particularly good as far as the Oulu and Kemi Rivers were concerned. As, however, the year-class then hatched did not appear to have created a record as regards abundance, it may be assumed that this was due to the low floods of the spring of 1928 (in the Tornio River between medium and low, in the Oulu River low, and in the Kemi River the lowest of the whole period — 1914—1928). It is probable that there were sufficient pairs of spawning salmon for the achievement of much greater possibilities.

This will suffice for the conditions in rivers flowing into the Bothnian Bay during the years when the superior year-classes were hatched.

With regard to the moderate year-classes I have observed that the two first year-classes, 1916/17 and 1917/18, particularly the former, might possibly have been midway between superior and moderate. In any event, the level of the water during the winter of 1916/17 was extremely favourable in all three rivers, even in the Tornio River, and the conditions cannot be considered bad during the winter of 1917/18. There was nevertheless a flood of very low water in all these rivers during the spring of 1916. The level of the flood water in the spring of 1917, on the other hand, was extremely high, particularly in the Tornio River, but also in the Kemi River (fairly low in the Oulu River). The weakness of the year-classes hatched during these winters — despite the good conditions — was probably influenced by the war-time shortage of food. This led to fishing during the spawning period, first of all illegally, and then from September 1917 to December 1st 1919, legally, in so far as seines could be drawn throughout the year in the upper waters of the Tornio and Kemi Rivers (in the Lapland district), and fishing with rod and line was allowed along the entire length of the rivers.

The water-level appears to have been unfavourable during the hatching of the 1921/22 year-class. The spring flood of 1921 was of medium height. The 1922/23 year-class, on the other hand, was hatched under more favourable circumstances, the spring floods of 1922 also having been higher.

During the hatching of the 1924/25 and 1925/26 year-classes the water-level conditions were favourable in the Oulu and Kemi Rivers; the spring floods were of medium height more or less. As, however, these year-classes did not become abundant, it may be assumed that too few individuals took part in the spawning.

During the hatching of the 1926/27 year-class the water level conditions were good in the Oulu River, but fairly bad in the Kemi River (as usual, it is rather difficult to make any definite statement about conditions in the Tornio River). The 1926 spring floods were high in the Oulu River, moderate in the Tornio River, and low in the Kemi River.

I have only placed three year-classes as definitely poor.

During the hatching of the 1918/19 and 1919/20 year-classes the water-level conditions were good in the Oulu River — that is, during these winters — but bad in the Kemi and Tornio Rivers. The spring flood of 1918 was high in the Kemi River, but low in the Oulu and Tornio Rivers; in 1919 high in the Oulu River, moderate in the Tornio River, but low in the Kemi River. The deficiency of both these year-classes also may be partly due to the excessive fishing of those years.

The water-level conditions in the winter of 1923/24 were unfavourable in all three rivers, as there were considerable falls in the level during the winter. The 1923 spring floods were high in the Tornio and Kemi Rivers, and moderate in the Oulu River.

The conditions prevailing in the salmon rivers flowing into the Bothnian Bay during the winters 1916/17, 1917/18, 1918/19 and 1919/20 appear to my mind to indicate that there was not always a sufficient number of salmon during the spawning, and that deficiencies may have occurred in this respect also.

I have pointed out in the preceding chapter that, according to the scale specimens which I have obtained from the Kymi River since the year 1925, the 1921/22 year-class has been the one best represented (1113 specimens). This agrees fairly well with the conditions prevailing in the lower reaches of the Kymi River during the winter of 1921/22 (the only place where the salmon are able to spawn). Assuming that the spawning has occurred during the beginning of November, the water has been below the level of that period on two occasions only — 13 and 15cm.

According to the specimens, however, the following year-class, 1922/23, has also appeared to be fairly rich, but there is some uncertainty as to the level of

the water during the winter if the spawning occurred during the first days of November 1922, when the level of the water in the river was comparatively high (200 cm.). According to the information which I have received, the spawning period in the Kymi River also has been abnormal, and under these circumstances it may be that I have wrongly estimated the spawning period (only 7 salmon — 5 of them females — were obtained that autumn from the hatchery in the Langinkoski Rapids, probably owing to the high level of the water).

The 1923/24 year-class has proved to be medium as regards its number of individuals. This agrees with the level of the water during the winter — there was a drop of 32 cm. in April.

The 1924/25 year-class was weak. This is also consistent with the water-level conditions of the winter. The level in the lower part of the Kymi River during the middle of March was as much as 41—49 cm. below that of November (beginning).

The 1925/26 year-class appears to have had even fewer individuals, according to the specimens, so that it must be considered as very weak (a total of only 112 specimens). This also appears to be due to the winter water-level conditions: the level of the water in the lower reaches of the Kymi was 50—67 cm. lower in February, March and April than it was at the beginning of November.

The 1926/27 and 1927/28 year-classes can be considered as fair, with regard to their abundance. The former was hatched during the favourable winter, with regard to the water-level conditions (only small fluctuations in the level of the water), and the latter probably under unfavourable conditions (great fluctuations), but it is also possible that the spawning did not occur at the time supposed (as also may be true of the 1922/23 year-class).

The 1928/29 year-class should probably be considered weak — the winter conditions were also bad.

The 1917/18 year-class has been one of the most prominent of the year-classes, representatives of which ascended the Kymi River in 1921—1924 and formed the catch. This is shown first of all by the fact that it was represented by 427 specimens among the 1926 scale specimens. This year-class was hatched under favourable conditions, as far as the level of the water is concerned. The spawning took place at such low water that the level was higher for the whole of the winter. The 1918/19 year-class also was hatched under similar circumstances, but is only weakly represented among my specimens (only 187 specimens), see p. 93. Is this because there were too few fish spawning?

The 1919/20 and 1920/21 year-classes are also weakly represented in the specimens for the years 1924 and 1928. It is difficult to form an opinion of the conditions prevailing during the preceding winter, while conditions were probably bad during the latter.

I will add a short survey of the water-level conditions in the Kymi River during the period 1914/15 to 1928/29, and of the heights of the spring floods.

1914/15. November 1st—10th: height 48—26 cm. If we assume that the spawning took place while the water was at a height of 40 cm., the water fell to 8 cm. on the 25th, at other periods the level has been below 40 cm. as follows: December 10 cm., January 4 cm., April 9 cm.

1915/16. November 1st—10th: height 80—57 cm. If the level of the water was 60 cm. during the spawning it had fallen by the end of March by 11 cm., but had been higher at all other periods.

1916/17. November 1st—10th: height 99—123 cm. If the spawning occurred at a height of 120 cm., the water had fallen below this level in November (3rd) 6 cm., February 2 cm., March 21 cm., and April 35 cm.

1917/18. November 1st—10th: height 79—91 cm. If the level of the water during the spawning was 90 cm. the water *remained above this level the whole winter* (lowest water in December: 15 cm., in January: 35 cm., later 47—73 cm. higher).

1918/19. November 1st—10th: height 94—112 cm. If the spawning took place at a level of 110 cm., the water remained above this level *for the whole of the winter* (minimum 6 cm. in March).

1919/20. November 1st—10th: height 110—77 cm. If the spawning took place at a level of 80 cm., the water remained above this level for the whole of the winter, although by no more than 4 cm. during the low waters of January, February and March. If the spawning occurred at 100 cm., the water during the above-mentioned months was 16 cm. lower, and if at 110 cm., 26 cm. lower.

1920/21. November 1st—10th: height 96—91 cm. Spawning apparently occurred at 90 cm. Water fallen below this level in November by 22 cm., December by 40 cm., January/February by 42 cm., beginning of March by 36 cm.

1921/22. November 1st—10th: height 57—52 cm. If spawning occurred at 55 cm., the low water seasons were below this level only in November by 15 cm., December by 13 cm., all other periods above the level.

1922/23. November 1st—10th: height 202—197 cm. Height at spawning probably 200 cm. Water fallen below this level: November 5 cm., January 13 cm., February 10 cm., end of March 61 cm., middle of April 78 cm., and 54 cm. up to the beginning of May.

1923/24. November 1st—10th: height 208—226 cm. Height at spawning can be estimated at 220 cm. Water fell below this level on March 18th, being 15 cm. lower on the 23rd and 24th, and even 32 cm. lower on April 26th.

1924/25. November 1st—10th: height 208—203 cm. Spawning level probably 205 cm. Water fell below this level by 6 cm. in November, 9 cm. in December, 18 cm. in January, 19 cm. in February, from middle of March onwards a maximum of 41—49 cm.

1925 26. November 1st—10th: height 129—118 cm. Height at spawning about 125 cm. Water fell below this level during low water periods:— November 9 cm., December 18 cm., January 27 cm., February 52 cm., March (middle) 64 cm., and middle of April 67 cm.

1926 27. November 1st—10th: height 94—82 cm. Height at spawning probably 85 cm. Water fell below this level in December by 7 cm., January by 3 cm., February 21 cm., March 9 cm., and April 17 cm.

1927 28. November 1st—10th: height 190—218 cm. If the spawning level is taken as 205 cm., the water fell below this height in November by 19 cm., December by 56 cm., end of January by 101 cm., end of February by 96 cm., end of March and beginning of April by no less than 121—120 cm.

1928 29. November 1st—10th: height 229—223 cm., so that the level at spawning was probably about 225 cm. The water remained at this level or above it up to March 4th, but subsequently fell rapidly by 56 cm. on March 21st, 92 cm. on April 17th, 85 cm. on May 1st

The spring floods in the lower reaches of the Kymi River (below the Anjalankoski Rapids) reached the following maximum heights:

1924	290 cm.	1928	215 cm.	1918	161 cm.
1922	280 cm.	1916	211 cm.	1914	149 cm.
1920	272 cm.	1923	209 cm.	1915	149 cm.
1927	247 cm.	1919	194 cm.	1917	129 cm.
1926	215 cm.	1925	184 cm.	1921	110 cm.

3. Final Survey.

The following results have been obtained from the investigations described.

1. The average catch — i. e., that obtained from the Gulf of Bothnia, principally the Bothnian Bay — over a number of consecutive years, is composed of the different life-cycle groups in the following manner: Half the catch, i. e. 50 %, is formed by salmon which, after a migratory period of 3 years, ascend the rivers in the fourth summer, i. e., the group A.3+. One quarter of the catch, i. e. 25 %, is composed of salmon which, belonging to the group A.2+, make their ascent after spending two years in the sea. Ten per cent. of the catch is composed of salmon that have ascended the rivers on their second migratory summer, belonging to the group A.1+ (grilse), and the same percentage of those that have spent four or five years on their first migration, thus belonging to the groups A.4+ and A.5+. The remaining five per cent. is composed of previously spawned salmon. This — to some degree generalized — result has been obtained by combining the results of the scale specimens from the whole Bothnian Bay area.

The corresponding figures obtained from the more southern salmon areas varies relatively little from the above. Group A.1+ shows a small decrease and previously spawned salmon an increase, on the above percentages, see pp. 38, 41, and 47.

This shows to what extent the annual catch of salmon depends on two consecutive life-cycle groups contributing three-fourths of the average number of salmon in the catch. The major portion of these two life-cycle groups (A.3 and A.2+) is composed of individuals belonging to two consecutive year-classes, although the variations in the smolt-age

Tables 30—33 see pp. 104—111.

Year-Class	Chief Catch Year and its Estimate based on Catch Statistics	Classification based on Scale Specimens	Conditions during Winter of Hatching
1914 15	1921 **max.**	—	good.
1915 16	1922 good	—	good.
1916 17	1923 good	—	good
1917 18	1924 fair	poor	good (Tornio River not known).
1918 19	1925 weak	poor	Oulu River good, elsewhere bad.
1919 20	1926 **min.**	poor	Oulu River good, elsewhere bad.
1920 21	1927 weak[1])	moderate	Oulu River extremely good, Kemi and Tornio Rivers not known.
1921 22	1928 weak	moderate	bad or unfavourable.
1922 23	1929 **min.**	moderate	partly good (Kemi River), partly very bad (Oulu, Tornio).
1923 24	1930 weak	moderate	partly weak, partly bad.
1924 25	1931 fair	superior	Oulu River good, Kemi and Tornio Rivers not known.
1925 26	1932 fair	superior	Oulu and Kemi Rivers good.
1926 27	1933 fair	superior	Oulu River good, Kemi River bad.
1927 28	1934 **max.**	**max.**	good.
1928 29	1935 **good**	good	good.

With regard to the Kymi River see pp. 99—100.

[1]) Simo area exceptional, see p. 90.

bring additions of individuals from the neighbouring year-classes — above and below. The variation in the smolt-age thus to some extent has a stabilising effect on the abundance of the different life-cycle groups, and therefore on the catch years.

2. The catch obtained in 1921—35 is composed of year-classes of which the first (rather important) was hatched in the winter of 1914/15, and the last (also rather important) during the winter of 1928/29. The representatives of each of these year-classes have returned to the Bothnian Bay area as a *major group* on their seventh year, belonging to the life-cycle class 3.3(+). The relative abundance of the year-classes is thus shown most clearly by the catch seven summers after the hatching of the year-class. The table on p. 101 shows the catch years in question at their year-classes, and the estimate of the catches from the Gulf of Bothnia during those years.

3. The table also includes the result of the mutual individual abundance of the year-classes which I have obtained from the scale specimens, grouped as follows:— first, maximum quantity (6229 specimens) and second largest quantity, extremely good (3364 specimens), then: superior (1800—2300 specimens), moderate (900—1500 specimens), and poor (below 500 specimens). A comparison between the estimates of the catch years shows a fair degree of conformity. (The 1920/21 year-class is an exception both as regards the total estimate of the year-class and the scale specimens. This year-class has yielded a maximum result in certain fishing areas — Simo area, see p. 90).

4. The table also includes the so-called conditions of the year-classes. These signify the water-level conditions during the winter when individuals belonging to the year-class were but fertilised eggs on the bed of the river. Conditions have been taken as *good* when the level of the water has not fallen during the whole of the winter, or has fallen only slightly below the level at which the spawning is believed to have occurred. Conditions have been taken as *bad* when large falls in the level of the water have been observed. The rivers in question are the Oulu, Kemi and Tornio Rivers. The good and bad conditions correspond fairly well to the estimates given to the chief catch years that coincide with each year-class. There are certain divergencies such as, for example, the 1917/18 and 1918/19 year-classes. It is possible that the increased fishing due to post-war food shortage decreased the numbers of spawning salmon. This same factor may probably also have affected the abundance of other year-classes.

APPENDIX.

Representation of the Sexes in the different Life-Cycle Groups.

I have given another result provided by my investigations in Table 34, pp. 112—114. It gives the sex representation in the different life-cycle groups, as they appear in collecting the material (this fact has not been taken into account in every case — it particularly concerns salmon in the grilse stage).

The table shows the sex determination of 28,727 salmon. Of this number 9,054 were male, and 19,682 female, corresponding to 31·5% and 68·5%. As 94·4% of the male and 93·9% of the female salmon have been on their first ascent, their percentages remain more or less unchanged, i. e. 31·6 and 68·4%. The great preponderance of the females is noticeable in the life-cycles A.2+ and A.3(+), i. e., in the life-cycles which form the main groups among individuals ascending to spawn. The relative number of females is more or less the same in each of these life-cycle groups — 75·5% in the former, and 76·2% in the latter. Males form the majority in salmon ascending in the grilse stage, as well as among those which ascend for the first time later on in life after migrations of 4 or 5 years. (As the sex of only part of salmon in the grilse stage has been determined, the percentage of males to females has remained smaller than it should have been).

Female salmon have also formed the majority among the previously spawned and reascending individuals — according to the statistics given in the table. They represent 70·3% (1054 specimens) of salmon on their second ascent, and 72·4% (142 specimens) of salmon on their third ascent. The relations have changed, in the opposite direction as regards salmon making more numerous ascents: 57·9% male and 42·1% female, but it should be pointed out that the material contained only a very small number of fish (11 males and 8 females).

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Table 30. High and Low Water in the Tornio River at Kukkolankoski during

Year	Breaking up of Ice		V	VI	VII	VIII	IX	X	XI	XI
1914	7—12/V	Max.	220 (23)	233 (5)	200 (2)	115 (1)	113 (25)	114 (2)	88 (27)	108 (1
		Min.	—	152 (25)	110 (26—28)	78 (31)	78 (1—2)	41 (31)	15 (8)	60 (6
1915	12—17/V	Max.	204 (30)	262 (16)	232 (18)	163 (1)	93 (9—11)	76 (1—2)	94 (30)	109 (5
		Min.	—	150 (30)	142 (4)	90 (30—31)	76 (27—29)	40 (28)	22 (3)	47 (2
1916	10—16/V	Max.	217 (21)	259 (12)	166 (1)	101 (31)	100 (1)	67 (1)	65 (12)	104 (2
		Min.	—	148 (26)	90 (30—31)	74 (21—22)	66 (18—19; 28)	24 (19)	36 (6)	47 (1
1917	23—27/V	Max.	251 (31)	359 (9)	188 (1)	112 (7—8)	122 (30)	190 (29—30)	175 (1)	186 (3
		Min.	—	178 (28)	106 (22)	88 (30)	93 (1)	124 (1—2)	130 (16)	127 (1
1918	18—21/V	Max.	232 (27)	235 (4)	198 (1)	97 (1)	108 (30)	160 (3)	149 (20)	142 (1
		Min.	—	180 (9)	99 (31)	60 (30—31)	61 (1—2)	105 (31)	77 (26)	93 (1
1919	12/V	Max.	277 (26)	231 (1)	141 (4)	134 (17—18)	204 (14)	204 (2)	109 (21)	123 (1
		Min.	—	124 (29)	93 (18)	86 (8—9)	125 (1)	106 (27)	81 (3)	81 (3
1920	10/V	Max.	351 (24—25)	270 (7)	170 (5—7)	167 (14)	143 (27)	125 (1)	79 (1)	117 (2
		Min.	—	143 (25)	122 (27—30)	109 (31)	95 (7—10)	73 (28)	50 (13—14)	67 (3
1921	29/IV—2/V	Max.	270 (25)	235 (4—5)	183 (3)	219 (10; 14)	221 (5)	148 (15)	122 (9—11)	155 (1
		Min.	—	145 (15)	109 (29)	120 (1)	136 (30)	79 (28)	95 (26)	115 (1
1922	7—10/V	Max.	290 (13)	235 (1)	183 (5—6)	149 (30—31)	168 (25—26)	142 (1)	109 (30)	137 (1
		Min.	—	155 (11)	109 (31)	102 (5—6)	99 (18)	79 (30)	65 (6)	96 (3
1923	20—22/V	Max.	296 (31)	292 (1)	235 (1)	205 (2)	196 (18)	196 (4)	160 (28)	164 (1
		Min.	—	158 (16)	139 (24)	103 (23; 26)	154 (10)	138 (27—28)	107 (11; 14)	112 (1
1924	14—17/V	Max.	288 (18)	274 (3)	201 (12)	117 (1)	162 (20)	150 (16—19)	156 (8; 30)	152 (1
		Min.	—	189 (17—18)	120 (31)	93 (31)	77 (10)	124 (6—7)	112 (24)	100 (2
1925	11—16/V	Max.	276 (23)	265 (6)	178 (2)	171 (24)	145 (12—13)	125 (5)	97 (30)	135 (6
		Min.	—	157 (27)	107 (29—30)	97 (17)	110 (3—4)	43 (23)	53 (6)	98 (2
1926	15—18/V	Max.	268 (27)	264 (8)	179 (5)	144 (29)	138 (15—16)	172 (16)	120 (21)	150 (1
		Min.	—	148 (28—29)	101 (31)	86 (15)	106 (29—30)	90 (29—30)	79 (28)	104 (3
1927	20—22/V	Max.	266 (31)	320 (27)	260 (1)	120 (1)	108 (26—30)	152 (11)	107 (14)	113 (1
		Min.	—	237 (13)	123 (31)	86 (28)	83 (18)	46 (27)	70 (1)	68 (1
1928	6—15/V	Max.	189 (10)	266 (19)	215 (31)	216 (1)	143 (7)	112 (1)	125 (21)	122 (2
		Min.	—	118 (1; 7)	150 (21)	135 (31)	116 (18—19; 21—22; 30)	55 (18)	88 (9—10)	85 (1
1929	17/V	Max.	294 (31)	288 (1)	172 (1)	118 (20)	180 (27)	160 (1)	162 (1)	158 (1
		Min.	—	148 (12—13)	110 (29—31)	109 (2; 11)	101 (20)	91 (21)	123 (30)	110 (2

1914—1930, by Months (Scale reading date in brackets).

zung	Year	I	II	III	IV	V
X	1915	79 (18—19)	65 (1)	53 (1)	83 (25—26)	
		63 (4—5)	53 (18—20)	43 (24—25)	46 (1—4; 7; 17—20)	65 (5)
16 XII	1916	54 (22—23; 28—31)	59 (17—18)	52 (1—8)	120 (30)	—
		47 (1—4)	51 (5—6)	46 (27—31)	35 (20)	128 (1)
X	1917	103 (1—2)	52 (1—2)	49 (13—17)	54 (22)	—
		52 (30—31)	40 (17—19)	45 (31)	28 (30)	22 (3—5)
XI	1918	145 (4—7)	91 (1—2)	86 (2)	103 (30)	
		92 (31)	84 (23—28)	75 (29—31)	74 (23—24)	107 (1)
XI	1919	130 (1; 4)	109 (7)	73 (1—2)	66 (27—30)	—
		106 (29—31)	73 (27—28)	62 (27; 30—31)	60 (8—9)	65 (1)
6 X	1920	81 (1—2)	71 (28—29)	74 (31)	130 (30)	
		67 (22—24; 27—31)	65 (7—13; 17—18)	66 (17)	74 (4)	134 (1)
XI	1921	95 (15—17)	73 (1)	62 (7—9)	169 (30)	—
		76 (31)	57 (24—28)	56 (1—2)	49 (11)	184 (1; 10)
X	1922	128 (4)	92 (1)	77 (1—6)	93 (30)	—
		94 (31)	74 (17—21)	68 (27—28)	67 (25)	110 (1)
7 X	1923	94 (1)	84 (1—2)	70 (1—2; 7—8)	61 (1—3)	—
		85 (30—31)	70 (27—28)	62 (28—31)	52 (29—30)	51 (1—7)
X	1924	162 (5)	115 (1)	83 (5—7)	82 (18—19)	—
		116 (31)	82 (26—29)	77 (29—31)	75 (3—6)	78 (1—4)
XI	1925	110 (12)	135 (7)	88 (1)	159 (24)	—
		96 (24)	89 (27—28)	72 (29—30)	72 (2—4; 7—8)	129 (7)
X	1926	101 (1)	66 (1)	64 (5—6; 10—13)	78 (30)	
		67 (30—31)	57 (14—18)	54 (26—29)	54 (25—27)	86 (1)
6 X	1927	104 (1)	84 (4—5)	80 (9—11)	65 (1; 7—11; 19—20)	
		82 (25—29)	78 (22—24; 27—28)	64 (28—30)	56 (30)	52 (5)
	1928	89 (1)	69 (8—10)	55 (7—13)	110 (30)	—
		54 (31)	53 (2—3)	48 (22—27)	48 (25)	118 (20)
X	1929	127 (3; 14)	95 (1)	80 (1—7; 12—15)	63 (1)	—
		94 (31)	80 (26—28)	66 (31)	21 (30)	20 (3—5)
	1930	161 (31)	163 (1)	86 (4)	95 (30)	
		100 (16)	84 (28)	68 (13—18)	56 (20—21)	103 (1)

Table 31. **High and Low Water in the Kemi River at Taivalkoski during**

Year	Breaking up of ice		V	VI	VII	VIII	IX	X	XI	XI
1914	2/V	Max.	550 (27)	526 (8—9)	216 (1)	148 (1—3)	174 (30)	182 (2—3)	138 (26—27)	200 (2
		Min.	—	222 (30)	120 (26)	120 (29—30)	124 (1)	120 (31)	90 (7)	138 (1
1915	1/V	Max.	436 (31)	434 (6—7)	276 (1)	210 (1)	148 (8—9)	138 (19—20)	160 (10—11)	264 (3
		Min.	—	286 (30)	214 (31)	126 (28—30)	130 (26—30)	108 (31)	112 (1)	162 (1
1916	9—11/V	Max.	464 (8; 22—23)	408 (13—14)	216 (1)	182 (31)	184 (1—2)	140 (1—3)	164 (25—26)	188 (2
		Min.	—	234 (30)	124 (30—31)	111 (20—21)	132 (22—23)	96 (22—23; 28—29)	96 (2—3)	120 (1
1917	17/V	Max.	478 (31)	680 (10)	282 (1)	172 (1)	265 (22; 30)	442 (28)	500 (30)	620 (2
		Min.	—	284 (30)	182 (31)	121 (26—28)	127 (1)	270 (1)	233 (25)	490 (1
1918	19/V	Max.	738 (16)	420 (1)	254 (1)	126 (1)	168 (30)	275 (22)	278 (11—12)	360 (1
		Min.	—	236 (20)	130 (31)	91 (25—26)	92 (1—4)	172 (1)	143 (24)	112 (6
1919	12/V	Max.	492 (29)	465 (1)	199 (1)	144 (21—22)	306 (30)	322 (2)	392 (13)	324 (1
		Min.	—	203 (30)	110 (31)	105 (3)	142 (1)	190 (31)	192 (1—2)	269 (2
1920	24/IV	Max.	628 (21; 24)	432 (1)	237 (7—8)	312 (16)	278 (27—28)	250 (1)	164 (18)	144 (2
		Min.	—	204 (30)	196 (23—24)	186 (31)	176 (10—11)	142 (31)	132 (9)	100 (5
1921	25/IV	Max.	536 (22)	389 (1)	270 (2)	282 (11)	268 (24—25)	286 (15—16)	440 (18)	400 (8
		Min.	—	200 (24)	188 (31)	190 (31)	198 (1)	182 (31)	182 (1)	372 (2
1922	4/V	Max.	760 (5)	374 (1)	234 (5)	184 (15)	164 (1)	165 (22—23)	177 (30)	274 (2
		Min.	—	200 (28)	142 (31)	134 (6—7)	132 (13—17)	116 (31)	100 (6)	184 (1
1923	20/V	Max.	625 (30)	614 (1)	313 (1)	188 (1)	301 (20)	288 (20)	588 (30)	582 (1
		Min.	—	294 (19)	189 (31)	118 (27)	163 (1)	274 (1)	235 (5)	376 (3
1924	14—22/V	Max.	688 (13)	558 (4)	263 (1)	135 (1)	255 (21)	223 (31)	239 (4)	206 (3
		Min.	—	276 (30)	138 (31)	106 (31)	103 (4)	188 (10)	153 (17—18)	151 (2
1925	8/V	Max.	538 (20—21)	358 (1)	211 (1)	248 (25)	224 (11—12)	193 (1)	298 (29)	334 (5
		Min.	—	214 (30)	130 (25—27)	135 (18)	178 (24—25)	132 (25—26)	141 (1)	294 (1
1926	7—17/V	Max.	492 (21)	358 (1)	259 (5)	155 (31)	175 (26—29)	246 (18)	356 (7)	300 (8
		Min.	—	220 (23—24)	147 (31)	108 (14—15)	142 (12)	140 (28)	198 (15)	228 (
1927	17—21/V	Max.	570 (31)	616 (3—4)	357 (1)	160 (1)	166 (29—30)	232 (10)	294 (4)	272 (
		Min.	—	348 (20)	162 (31)	127 (22—23)	150 (1)	168 (1—2)	200 (1)	258 (2
1928	5—11/V	Max.	388 (10)	363 (19)	299 (28)	309 (1)	196 (1)	179 (1—2)	355 (17)	296 (1
		Min.	—	218 (10—11)	173 (17—18)	198 (31)	170 (16—19)	124 (23—24)	130 (5; 7)	228 (
1929	15—20/V	Max.	538 (20—21)	451 (1)	185 (1)	164 (31)	233 (5)	285 (31)	295 (2)	232 (3
		Min.	—	186 (30)	134 (30—31)	128 (3—4; 8—10)	170 (27—28)	172 (1—2)	230 (30)	203 (

1914—1930, by Months (Scale reading date in brackets).

zing	Year	I	II	III	IV	V
XI	1915	276 (14—15)	282 (8)	242 (1)	332 (27)	
		200 (1)	244 (28)	196 (30—31)	190 (12—19)	208 (5—6)
XII	1916	268 (1—2)	248 (1—2)	212 (1—2)	306 (30)	—
		250 (29—31)	216 (26—29)	190 (29—31)	192 (1)	344 (1—10)
X	1917	246 (14)	216 (1)	196 (11; 14)	206 (17—18; 27)	—
		190 (1)	168 (28)	158 (31)	140 (12)	160 (22)
XI	1918	588 (1)	446 (1—2)	393 (1)	361 (11—12)	—
		450 (31)	395 (28)	346 (29—31)	314 (25)	330 (1)
XII	1919	320 (11)	284 (3—4)	272 (6)	248 (30)	—
		280 (31)	262 (28)	239 (31)	218 (15—16)	253 (1)
XI	1920	270 (1)	266 (13)	238 (1)	432 (23)	—
		251 (15)	240 (28—29)	215 (22)	228 (1)	323 (2)
	1921	238 (26; 31)	254 (7)	232 (1)	408 (30)	—
		130 (1)	230 (27)	193 (31)	195 (1)	409 (31)
XI	1922	396 (11—12)	394 (20)	378 (1)	328 (1)	—
		376 (24—25)	380 (28)	330 (31)	276 (28)	330 (1)
	1923	256 (31)	275 (9—10)	218 (5—6)	160 (8—9; 30)	—
		225 (14—15)	212 (28)	150 (29—30)	151 (17—18)	160 (1)
XII	1924	374 (1)	280 (1)	250 (1)	220 (1)	—
		280 (31)	250 (29)	220 (31)	201 (27)	220 (1—2)
XI	1925	256 (31)	355 (9)	300 (15—16)	334 (23)	
		200 (17—18)	242 (19—20)	242 (31)	204 (13—14)	236 (3)
X	1926	294 (1)	278 (2—3)	250 (1)	235 (30)	—
		274 (29—30)	254 (28)	150 (30—31)	146 (3—4)	258 (1)
X	1927	314 (22—23)	270 (1)	190 (1)	142 (9—10)	—
		275 (31)	192 (28)	142 (31)	120 (28—29)	124 (1)
X	1928	272 (20)	260 (1)	239 (8—9)	236 (30)	—
		262 (31)	238 (29)	220 (30—31)	220 (9—11)	228 (5)
X	1929	276 (31)	282 (25—26)	274 (1)	176 (1)	—
		258 (3—4)	272 (9—11)	178 (31)	150 (27—28)	152 (1—2)
XI	1930	310 (31)	325 (3)	319 (1)	246 (1)	
		178 (19)	315 (1; 13—14; 26—28)	248 (30—31)	187 (24)	248 (1; 5)

Table 32. **High and Low Water in the Oulu River at Muhos the du**

Year	Breaking up of ice		V	VI	VII	VIII	IX	X	XI	X
1914	25/IV	Max.	214 (31)	236 (8; 10—12)	215 (1)	138 (1)	115 (3—4)	102 (1; 15—17)	170 (29)	180 (2
		Min.	—	215 (1)	140 (31)	114 (28)	100 (26—27)	96 (29—31)	89 (18)	130 (8
1915	27/IV	Max.	160 (31)	184 (17—18)	176 (1)	140 (1)	93 (2)	98 (31)	104 (17)	81 (1
		Min.	—	160 (1)	141 (31)	94 (31)	59 (27)	61 (26)	79 (25)	68 (
1916	30/IV	Max.	206 (1)	202 (19)	182 (1—2)	120 (1)	83 (1)	84 (31)	134 (30)	136 (1 2-
		Min.	—	156 (1—2)	125 (31)	84 (31)	58 (27—28)	49 (15)	59 (6—7)	103 (1
1917	15/V	Max.	211 (7)	233 (30)	233 (1)	171 (1)	126 (30)	184 (26)	350 (30)	352 (
		Min.	—	183 (1)	173 (31)	114 (31)	93 (6)	126 (4—5)	184 (1)	300 (
1918	27/IV	Max.	176 (31)	192 (26)	211 (7)	159 (1)	181 (28)	166 (29—31)	221 (23)	229 (
		Min.	—	176 (1)	161 (31)	101 (30)	86 (11)	140 (4)	166 (1—2)	209 (1
1919	3/V	Max.	296 (3)	301 (26)	256 (1)	168 (1)	138 (28)	172 (25—26)	252 (14—23)	247 (1
		Min.	—	207 (1)	170 (31)	118 (27—29)	98 (19—20)	128 (3)	152 (6)	190 (
1920	19/IV	Max.	379 (25)	368 (1)	272 (1)	178 (1)	128 (21)	107 (1)	145 (17)	239 (2
		Min.	—	274 (30)	178 (31)	130 (31)	101 (16)	88 (22)	92 (3—6)	128 (1
1921	14—16/IV	Max.	249 (20—21)	239 (1)	177 (1)	162 (9)	137 (22)	202 (31)	298 (12)	277 (1
		Min.	—	179 (26; 28)	144 (28)	125 (31)	110 (28)	107 (6)	209 (1)	250 (
1922	4—6/V	Max.	—	302 (2)	273 (2)	218 (9)	180 (1)	137 (1)	190 (10)	180 (
		Min.		270 (29)	197 (29)	181 (31)	137 (30)	109 (28)	144 (17)	169 (1
1923	12—14/V	Max.	271 (18)	275 (23—24)	266 (1—2)	223 (1)	174 (28)	242 (26)	272 (6)	269 (
		Min.	—	199 (1)	225 (31)	158 (31)	147 (7)	165 (5—6)	219 (1)	212 (
1924	6—14/IV	Max.	297 (31)	379 (2)	347 (1)	209 (1—2)	132 (1)	110 (1)	106 (3; 30)	149 (
		Min.	—	306 (1)	210 (31)	134 (31)	110 (27)	94 (26)	82 (27)	108 (
1925	19—21/IV	Max.	226 (30)	224 (1—3; 6—7)	190 (4—5)	139 (1)	93 (1—2)	92 (29)	147 (5—10; 24—26)	146 (
		Min.	—	188 (30)	138 (28)	94 (30—31)	67 (27—28)	64 (19—20)	81 (1)	142 (
1926	3—4/V	Max.	302 (2)	205 (30)	209 (3;5—6; 8—12)	182 (1)	135 (1)	152 (31)	217 (22)	212 (
		Min.	—	185 (19—20)	184 (31)	133 (30)	101 (30)	101 (27)	111 (18)	202 (
1927	8—11/V	Max.	248 (9)	302 (25—26)	296 (1)	217 (1)	151 (1)	195 (31)	219 (2; 9—11)	175 (
		Min.	—	249 (1)	218 (29—30)	153 (31)	126 (30)	112 (28)	177 (30)	148 (
1928	29/IV—1/V	Max.	208 (16—17)	217 (13)	214 (22)	200 (2—3;9)	171 (1)	142 (31)	235 (18)	231 (
		Min.	—	191 (1—2)	184 (9)	173 (31)	128 (30)	112 (20)	135 (9)	180 (
1929	12—13/V	Max.	292 (13)	246 (19)	221 (1)	163 (1)	155 (20—21)	190 (16)	232 (29)	232 (
		Min.		222 (30)	164 (31)	132 (23)	143 (28—30)	141 (2)	179 (5; 25)	217 (

1914—1930, by Months (Scale reading date in brackets).

ng	Year	I	II	III	IV	V
XI	1915	171 (2—3)	165 (1—6)	157 (1)	220 (27)	—
		165 (29—31)	157 (28)	142 (31)	138 (11—12)	106 (11)
I	1916	68 (1—7)	64 (1—7)	62 (1—14)	306 (27)	
		64 (29—31)	62 (17—29)	59 (28—31)	54 (12—19)	112 (5)
II	1917	137 (3)	122 (1—3)	116 (1—4)	202 (26)	
		122 (30—31)	116 (28)	108 (29—31)	102 (21)	151 (25; 27)
XI	1918	—	278 (1)	251 (1)	235 (1)	—
		—	251 (28)	236 (30—31)	164 (30)	127 (13)
II	1919	226 (6)	200 (1)	176 (1)	233 (29)	—
		201 (31)	178 (28)	161 (31)	146 (13)	178 (19)
XI	1920	189 (1—7)	183 (1—2)	154 (1)	368 (18—19)	—
		183 (30—31)	155 (29)	128 (24—28)	143 (1)	266 (1; 4—5)
I XII	1921	234 (10)	195 (1—2)	167 (1)	247 (14)	—
		190 (1—3)	169 (28)	115 (22—23)	120 (2)	187 (1)
X XI	1922	249 (1)	234 (1)	195 (1)	287 (30)	
		228 (26—27)	197 (28)	153 (31)	137 (22)	—
XI	1923	176 (1)	146 (1)	132 (1)	110 (1)	—
		148 (31)	133 (28)	111 (26; 29—31)	94 (30)	93 (2—3)
II	1924	273 (4)	228 (1)	209 (1)	173 (1)	—
		229 (31)	210 (25—26; 29)	174 (31)	159 (29—30)	160 (1—2)
I	1925	142 (5—7)	117 (1)	101 (6—8)	249 (19)	—
		118 (31)	97 (27)	94 (31)	92 (3)	136 (1)
I	1926	144 (3—4)	141 (10—13)	140 (1)	287 (30)	—
		138 (15)	135 (22—23)	124 (29; 31)	118 (8; 21—22)	122 (10—11)
X XI	1927	210 (1—2)	192 (1)	178 (5—6)	153 (1)	—
		193 (31)	177 (28)	154 (31)	124 (25)	127 (1)
XII	1928	147 (1—2)	130 (1)	112 (1)	288 (29)	—
		131 (26—31)	112 (29)	99 (29—31)	98 (1—3)	132 (8—9)
I	1929	254 (13)	202 (1)	198 (3)	173 (1)	
		202 (31)	198 (27—28)	174 (31)	151 (19—30)	115 (5)
X XII	1930	340 (31)	343 (2—3)	268 (1)	197 (1)	—
		211 (3—5; 15)	269 (28)	202 (31)	122 (21)	138 (8—9)

Table 33. **High and Low Water in the Kymi River at Anjala durin**

Year	Breaking up of ice		V	VI	VII	VIII	IX	X	XI	X
1914	15—21/IV	Max.	136 (30)	149 (15; 17—19)	145 (1)	116 (1)	83 (4)	70 (1)	49 (18)	74 (
		Min.		130 (1)	114 (26)	64 (30)	48 (27)	37 (25)	8 (23)	30 (
1915	21—23/IV	Max.	127 (29)	149 (21; 23; 30)	149 (1—3)	133 (2)	110 (8)	100 (9)	108 (15)	116 (
		Min.		127 (1)	128 (25)	97 (29)	88 (26)	71 (31)	54 (27)	80 (
1916	16—24/IV	Max.	196 (29)	211 (29)	209 (1)	177 (1)	150 (1)	111 (12)	134 (13)	157 (
		Min.		190 (1)	177 (30)	148 (20)	103 (30)	96 (22)	99 (1)	114 (
1917	24/IV—4/V	Max.	125 (29)	129 (16; 30)	129 (2)	101 (1)	75 (25)	89 (27)	118 (30)	161 (
		Min.		114 (3)	101 (29)	67 (26; 30—31)	45 (9)	45 (1)	79 (4; 11)	105 (
1918	11—22/IV	Max.	170 (1)	161 (1—3)	148 (1—4)	122 (1)	92 (1)	94 (30—31)	123 (29—30)	164 (
		Min.		147 (30)	125 (31)	91 (28—30)	73 (27—28)	78 (1)	94 (1—3)	130 (
1919	20/IV	Max.	195 (27; 29)	194 (1; 9)	194 (5)	173 (1)	141 (1)	117 (16)	133 (22)	123 (
		Min.		181 (23; 29)	173 (29; 31)	134 (31)	105 (25)	105 (4; 19)	77 (9)	91 (
1920	30/III-13/IV	Max.	264 (31)	272 (9)	257 (1)	208 (1)	171 (1—2)	136 (1)	96 (1)	68 (
		Min.		257 (30)	209 (31)	172 (29; 31)	136 (30)	92 (31)	68 (30)	50 (
1921	1—2/IV	Max.	117 (12)	110 (2)	89 (1)	82 (1—2)	59 (1)	49 (31)	57 (6)	66 (
		Min.		90 (30)	80 (13—14)	59 (31)	39 (30)	36 (4—5)	40 (20—21)	42 (
1922	—	Max.	232 (31)	280 (30)	283 (5—8)	268 (1—2)	251 (1)	227 (1)	213 (29—30)	235
		Min.		233 (1)	269 (30—31)	252 (30—31)	227 (30)	205 (31)	195 (13—15)	212
1923	—	Max.	179 (22; 28—29; 31)	209 (28; 29)	214 (24—26)	209 (1; 4)	184 (11—12)	207 (31)	266 (27)	312 (
		Min.		179 (1)	199 (4—5)	181 (30—31)	174 (21—22)	182 (1;8—9)	208 (1)	260
1924	—	Max.	258 (30—31)	290 (17; 30)	300 (18—19; 21)	288 (1)	250 (1)	215 (1)	208 (1—4)	202
		Min.		259 (1)	288 (31)	251 (31)	217 (29—30)	206 (28)	199 (19)	194
1925	8/IV	Max.	176 (5; 10; 29)	184 (27—29)	176 (1;3—7; 10; 12)	147 (18)	130 (28)	149 (10)	133 (30)	159
		Min.		176 (8; 15; 25—26)	141 (29—31)	117 (29)	100 (24)	111 (2)	114 (24)	107
1926	28/IV	Max.	206 (26)	215 (22)	213 (1)	182 (2)	140 (1)	106 (1)	112 (14)	125
		Min.	—	203 (1)	175 (24)	143 (31)	99 (25)	91 (7; 30)	82 (5; 8)	78
1927	—	Max.	215 (30)	247 (28—30)	256 (7—9; 11; 13—15)	254 (1; 6)	224 (1)	209 (6)	232 (22—23)	198
		Min.		210 (2)	249 (1; 29—31)	224 (31)	200 (19—20)	174 (30)	186 (30)	149
1928	23/IV	Max.	188 (30—31)	215 (26—27)	218 (2)	212 (13)	225 (25)	230 (24—25)	246 (30)	280
		Min.		190 (1—2)	206 (24)	198 (31)	198 (13—14)	200 (8)	233 (10)	244
1929	21/IV	Max.	188 (31)	215 (3)	206 (15)	187 (2—3)	168 (10; 23; 26—27)	200 (16)	223 (30)	243
		Min.		188 (1)	187 (30—31)	157 (31)	152 (5)	163 (1)	195 (3)	222

1914—1930, by Months (Scale reading date in brackets).

ering	Year	I	II	III	IV	V
.II	1915	81 (8)	66 (15)	60 (16)	127 (27—28)	—
		36 (5)	49 (1; 13)	47 (20)	31 (4)	105 (16)
23/XI	1916	106 (3)	88 (2)	80 (1; 27)	149 (22; 24—25)	—
		83 (14; 16)	77 (27)	49 (26)	68 (2)	138 (5; 7)
-21/XII	1917	185 (3)	142 (9)	117 (7)	142 (23)	—
		130 (31)	118 (18)	99 (25)	85 (9)	110 (13)
—5/XII	1918	204 (11)	172 (1—2)	162 (1—3)	180 (15)	—
		125 (4)	163 (23—24; 26—28)	138 (31)	137 (2)	160 (17—22)
—6/XII	1919	149 (9; 25)	146 (8)	134 (31)	181 (18)	—
		138 (1; 21)	128 (26—27)	116 (18)	124 (3)	173 (6)
/X	1920	129 (1)	104 (4)	108 (31)	204 (26—27; 29)	—
		84 (25)	84 (28—29)	84 (3; 21)	108 (2)	209 (1)
	1921	60 (5; 22)	74 (20—21)	98 (31)	119 (7; 23—24)	—
		48 (15—16)	50 (1)	54 (6)	102 (1)	110 (31)
XI	1922	94 (31)	96 (15—17)	89 (1)	154 (30)	—
		61 (3)	86 (26)	76 (30—31)	75 (1)	156 (1)
	1923	239 (5—7)	205 (22—23)	191 (1)	143 (30)	—
		187 (29—30)	190 (1)	139 (31)	122 (18—19)	146 (1; 5)
	1924	315 (8—11)	276 (1)	243 (2)	214 (1)	—
		268 (19—20)	239 (28)	205 (23—24)	188 (26; 28; 30)	187 (2)
	1925	235 (31)	223 (1)	190 (2)	176 (29)	—
		187 (20)	186 (5; 7—8)	164 (26; 28; 31)	163 (15)	166 (20)
	1926	114 (12)	102 (8)	78 (3—4)	151 (26)	—
		98 (31)	73 (14)	61 (23)	58 (14; 16)	145 (7)
XII	1927	107 (18; 21; 24)	101 (7)	90 (26)	142 (29)	—
		82 (29)	64 (27)	76 (9; 12)	68 (7)	134 (1)
	1928	188 (3)	127 (23)	115 (1)	135 (29—30)	—
		104 (31)	109 (28—29)	84 (27)	85 (4)	136 (2; 8)
XII	1929	299 (31)	294 (1)	231 (1—2)	165 (1)	—
		251 (14)	226 (28)	169 (21)	133 (17)	140 (1)
	1930	295 (31)	338 (5)	265 (1)	222 (24—25)	—
		250 (1)	268 (28)	226 (31)	215 (27; 30)	192 (25)

Appendix: Table 34. Representation of the Sexes in the different Life-Cycle-Groups.

A. Salmon which have not spawned previously.

Districts:	♂♂ 2.1+	♀♀ 2.1+	♂♂ 3.1+	♀♀ 3.1+	♂♂ 4.1+	♀♀ 4.1+	♂♂ 5.1+	♀♀ 5.1+	♂♂ A.1+	♀♀ A.1+	♂♂ Percentage	♀♀ Percentage
Tornio	9	4	522	361	258	180	22	33	811	578	58·4	41·6
Kemi	19	1	268	55	61	25	9	3	357	84	81·0	19·0
Oulu	44	8	178	34	27	4	3	—	252	46	84·6	15·4
Kokemäki	1	1	—	2	—	—	—	—	1	3	—	—
Kymi	139	222	11	38	—	1	—	—	150	261	36·5	63·5
Total	**212**	**236**	**979**	**490**	**346**	**210**	**34**	**36**	**1571**	**972**	**61·8**	**38·2**
	2.2+		3.2+		4.2+		5.2+		A.2+		Percentage	
Tornio	5	9	366	850	147	445	6	15	524	1319	28·4	71·6
Kemi	63	91	433	1472	61	360	—	9	557	1932	22·4	77·6
Oulu	46	113	196	570	21	88	—	2	263	773	25·4	74·6
Kokemäki	22	54	11	20	—	—	—	—	33	74	30·8	69·2
Kymi	280	950	36	158	1	1	—	—	317	1109	22·2	77·8
Total	**416**	**1217**	**1042**	**3070**	**230**	**894**	**6**	**26**	**1694**	**5207**	**24·5**	**75·5**
	2.3		3.3		4.3		5.3		A.3(+)		Percentage	
Tornio	14	33	409	851	115	170	—	2	538	1056	33·8	66·2
Kemi	123	389	1036	3049	169	437	1	2	1329	3877	25·5	74·5
Oulu	82	626	463	3426	50	393	—	5	595	4450	11·8	88·2
Kokemäki	376	463	56	78	2	—	—	—	434	541	44·5	55·5
Kymi	543	1226	96	149	1	1	—	—	640	1376	31·7	68·3
Total	**1138**	**2737**	**2060**	**7553**	**337**	**1001**	**1**	**9**	**3536**	**11300**	**23·8**	**76·2**
	2.4		3.4		4.4		5.4		A.4(+)		Percentage	
Tornio	6	1	92	22	20	11	—	—	118	34	77·6	22·4
Kemi	47	23	414	147	49	8	1	—	511	178	74·2	25·8
Oulu	71	85	366	507	39	58	—	—	476	650	42·3	57·7
Kokemäki	165	55	28	7	—	1	—	—	193	63	75·4	24·6
Kymi	233	55	32	4	—	—	—	—	265	59	81·8	18·2
Total	**522**	**219**	**932**	**687**	**108**	**78**	**1**	—	**1563**	**984**	**61·4**	**38·6**
	2.5		3.5		4.5		5.5		A.5(+)		Percentage	
Tornio	1	—	13	2	—	—	—	—	14	2	87·5	12·5
Kemi	7	—	65	1	2	—	—	—	74	1	98·7	1·3
Oulu	9	1	54	8	4	2	1	—	68	11	86·1	13·9
Kokemäki	9	1	—	—	—	—	—	—	9	1	90·0	10·0
Kymi	4	—	1	—	—	—	—	—	5	—	100·0	—
Total	**30**	**2**	**133**	**11**	**6**	**2**	**1**	—	**170**	**15**	**91·9**	**8·1**
								All ascending for the first time...	**8534**	**18478**	**31·6**	**68·4**

B. Salmon which have spawned once previously.

	2.1+G1+		3.1+G1+		4.1+G1+		A.1+G1+		Percentage	
Tornio	1	—	18	7	6	1	25	8	75·8	24·2
Kemi	—	2	17	7	2	3	19	12	61·3	38·7
Oulu	3	2	25	5	7	—	35	7	83·3	16·7
Kokemäki	—	—	—	—	—	—	—	—	—	—
Kymi	19	11	2	4	—	—	21	15	58·3	41·7
Total	**23**	**15**	**62**	**23**	**15**	**4**	**100**	**42**	**70·4**	**29·6**

Table 34 (continued).

Districts:	♂♂ 2.1+G2	♀♀ 2.1+G2	♂♂ 3.1+G2	♀♀ 3.1+G2	♂♂ 4.1+G2	♀♀ 4.1+G2	♂♂ A.1+G2	♀♀ A.1+G2	♂♂ Percentage	♀♀ Percentage
Tornio	—	—	1	1	1	—	2	1	66·7	33·3
Kemi	4	2	11	9	2	—	17	11	60·7	39·3
Oulu	—	4	12	6	2	1	14	11	56·0	44·0
Kokemäki	4	1	—	—	—	—	4	1	80·0	20·0
Kymi	7	—	—	—	—	—	7	—	100·0	—
Total...	**15**	**7**	**24**	**16**	**5**	**1**	**44**	**24**	**64·7**	**35·3**
	2.1+G3		3.1+G3		4.1+G3		A.1+G3		Percentage	
Kemi	1	—	4	—	1	—	6	—	100	—
Oulu	—	—	2	—	—	—	2	—	100	—
Total...	**1**	**—**	**6**	**—**	**1**	**—**	**8**	**—**	**100**	**—**
	2.2+G1		3.2+G1		4.2+G1		A.2+G1		Percentage	
Tornio	—	—	4	7	3	4	7	11	38·9	61·1
Kemi	—	5	7	53	1	10+1[1])	8	69	10·4	89·6
Oulu	—	1	13	18	—	2	13	21	38·2	61·8
Kokemäki	4	5	—	2	—	—	4	7	36·4	63·6
Kymi	13	57	3	5	—	—	16	62	20·5	79·5
Total...	**17**	**68**	**27**	**85**	**4**	**17**	**48**	**170**	**22·0**	**78·0**
	2.2+G2		3.2+G2		—		A.2+G2		Percentage	
Kemi	—	—	4	—	—		4	—	100	—
Oulu	1	1	5	—	—		6	1	85·7	14·3
Kymi	2	—	—	—	—		2	—	100	—
Total...	**3**	**1**	**9**	**—**	**—**		**12**	**1**	**92·3**	**7·7**
	2.3G1		3.3G1		4.3G1		A.3G1		Percentage	
Tornio	2	3	9	31	1	15	12	49	19·7	80·3
Kemi	3	18	33	208	3	23	39	249	13·5	86·5
Oulu	5	23	6	114	—	9	11	146	7·0	93·0
Kokemäki	63	98	8	7	—	—	71	105	40·3	59·7
Kymi	47	168	5	26	—	—	52	194	21·1	78·9
Total...	**120**	**310**	**61**	**386**	**4**	**47**	**185**	**743**	**19·9**	**80·1**
	2.3G2		3.3G2		—		A.3G2		Percentage	
Kemi	—	1	—	—	—		—	1	—	100
Oulu	—	—	—	1	—		—	1	—	100
Kymi	—	—	1	—	—		1	—	100	—
Total...	**—**	**1**	**1**	**1**	**—**		**1**	**2**	**33·3**	**66·7**
	2.4G1		3.4G1		4.4G1		A.4G1		Percentage	
Tornio	—	—	1	2	1	1	2	3	40·0	60·0
Kemi	3	3	14	17	1	2	18	22	45·0	55·0
Oulu	—	2	6	26	—	1	6	29	17·1	82·9
Kokemäki	17	10	—	2	—	—	17	12	58·6	41·4
Kymi	2	5	1	1	—	—	3	6	33·3	66·7
Total...	**22**	**20**	**22**	**48**	**2**	**4**	**46**	**72**	**39·0**	**61·0**
	—		3.5G1		4.5G1		A.5G1		Percentage	
Oulu	—		1	—	1	—	2	—	100	—
			All ascending for the second time:				**446**	**1054**	**29·7**	**70·3**

[1]) This one is 5.2+G1.

Table 34 (continued).

C. Salmon which have spawned twice previously.

	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
	2.1+G1G1									
Oulu	—	1								
Kymi	—	1								
	2.1+G2G1		3.1+G2G1							
Kemi	—	—	1	—						
Oulu	—	—	1	—						
Kymi	1	—	—	—						
	2.2+G1G1		3.2+G1G1		4.2G1G1		A.2+G1G1		Percentage	
Tornio	—	—	—	2	—	—	—	2	—	100
Kemi	1	1	1	2	2	1	4	4	50	50
Oulu	—	1	—	—	—	—	—	1	—	100
Kokemäki	—	—	1	—	—	—	1	—	100	—
Kymi	7	9	1	3	—	—	8	12	40	60
Total...	**8**	**11**	**3**	**7**	**2**	**1**	**13**	**19**	**40·6**	**59·4**
	2.3G1G1		3.3G1G1		4.3G1G1		A.3G1G1		Percentage	
Tornio	—	—	—	4	—	1	—	5	—	100
Kemi	2	4	6	24	—	5	8	33	19·5	80·5
Oulu	—	4	2	25	1	1	3	30	9·1	90·9
Kokemäki	11	4	5	3	—	—	16	7	69·6	30·4
Kymi	7	40	2	2	—	—	9	42	17·6	82·4
Total...	**20**	**52**	**15**	**58**	**1**	**7**	**36**	**117**	**23·5**	**76·5**
	2.4G1G1		3.4G1G1							
Kemi	—	—	—	1						
Oulu	—	—	—	1						
Kokemäki	2	—	—	—						
Kymi	—	2	—	—						
					All ascending for the third time:		**54**	**142**	**27·6**	**72·4**

D. Salmon which have spawned three times previously.

	—		3.1+G2G1G1	
Kemi	—		—	1
	2.2+G1G1G1		3.2+G1G1G1	
Tornio	—	—	—	1
Kymi	—	1	—	—
	2.3G1G1G1		3.3G1G1G1	
Kemi	—	—	2	1
Oulu	—	1	1	—
Kokemäki	5	—	—	—
Kymi	2	1	—	—
	—		3.4G1G1G1	
Tornio	—		—	2

E. Salmon which have spawned four times previously.

	—		—	4.1+G+G+G+G1				
Kemi	—		—	1	—			
				All ascending for the fourth or fifth time:		**11**	**8**	**57·9**	**42·1**
				All specimens:		**9045**	**19682**	**31·5**	**68·5**